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## ILLUSTRATIONS.


Diagram of Proposed Improvement at Hyde Park Corner ..... 238
Proposed New Cathedral for Manchester (View from the Nave, looking East).—Designed by Mr. E. H. Carpenter, Architect 240, 241
Aquarium Construction: Arrangement of Water Supply ..... 243


## CONTENTS.


Windsor and its Castle ..... 227
Gwilt's Encyclopædia ..... 229
Knightsbridge Barracks ..... 230
The German Athenæum ..... 230
The Horus Myth ..... 230
Enlargement of the Gloucester Corn Exchange ..... 230
Professor Edward M. Barry's Lectures on Architecture ..... 231
The St. Gothard Tunnel ..... 234
"The Treatment of Scientific Engineering Artistically": Architectural Association ..... 235
The Palace of Tiroomal Naik, Madras Royal Institute of British Architects ..... 236
Constitution-hill and the Knightsbridge Barracks ..... 238
Proposed New Cathedral for Manchester ..... 238
A Sacrifice to Theory ..... 238
"Aquaria and their Construction": Civil and Mechanical Engineers' Society ..... 243
The Law of Contracts ..... 244
Stained Glass Windows ..... 245
Legislation on the Construction of Houses ..... 247
A New Looking-Glass ..... 247
Modern Mosaics ..... 247
The Improvement of French Ports ..... 247
The Dublin Schools of Art ..... 247
The Cost of Building St. Thomas's Hospital, and Assessment ..... 248
The Trade and Annual Value of the Surrey Commercial Dock Company ..... 248
The Floods: the Institution of Civil Engineers ..... 248
The Peabody Fund ..... 248
The Metropolitan Water Supply ..... 249
Light and Colour ..... 249
The Systematic Measurement of the Human Figure ..... 249
Silicate Paint ..... 250
Cements ..... 250
"Steeple Jack" ..... 250
Some New Bank Premises ..... 250
St. Werburgh's Tower, Bristol ..... 250
How Drain Pipes are Laid at Bilston (and Elsewhere) ..... 250
Damage of Building Goods by Railway Company: Card v. London, Brighton, and South Coast Railway Company ..... 250
Tobin's Ventilators ..... 251
Miscellanea ..... 251


## *Windsor and its Castle.*

WHEN England is sending her tens of thousands on holiday excursions all over the globe, there is always some one ready to tell these travellers that they should see their own country before they go abroad. The advice is seldom heeded by those who can afford to cross the Channel, but the Englishman who sees Versailles or Fontainebleau before Windsor Castle certainly deserves censure. The Londoner is justly proud of his river, and of the beautiful places that are situated on its banks within easy distance of his home. Of all these places, the crown unquestionably belongs to Windsor and its castle, both for the beauty of their situation and the multiplicity of their historical associations.

Windsor Castle has been the residence of our kings for 800 years, and during the greater portion of that term it has been their chief palace, and the only one worthy of their position. Old Windsor dates still further back as a royal residence, and New Windsor grew into existence very shortly after the castle was built. The history of such places as these must necessarily be a long one, but we shall endeavour to condense into a small compass some account of the salient features in the growth of both castle and town. Old Windsor is supposed to have been known to the Romans, on account of its nearness to one point of the Roman road from London to Silchester, and also because Roman coins and urns have been found at St. Leonard's, near Windsor, and Roman bricks, &c., at Old Windsor. The manor belonged to the Saxon kings, who are supposed to have had a palace there from a very early period, and it is certain that Edward the Confessor sometimes held his court at the royal "ville of Wendlesore." In the year 1066 the king granted all his lands in Windsor and Staines to the Monastery of St. Peter at Westminster, but the new proprietors did not hold the property long, for William the Conqueror, being pleased with the situation of Old Windsor, obtained it in the first year of his reign by exchange for certain other lands. He and his successors used the old palace, which is supposed to have stood a little to the west of the church, for a long time, as a place for hawking and hunting. Camden proposed an etymology for Windsor which has been accepted by several writers, but which is quite without authority, and the great antiquary took no account of the fact that the earliest form of the name is Windlesore, and not Windsor. He says it was called by the Saxons Windeshora, "perhaps from the windings of the banks" of the river; but near by is the little river Windles, which gives its name to Windlesham, as it probably does also to Windsor. John Stow, in his description of the castle, gives some very amusing etymologies:—"The name whereof (not without cause) is called Wyndsore; whether it came as some affirme of ye fery over ye rivar there, ye passengers usynge (in callynge for ye boate) to bydd them wynd to shoar (because ye boate, then as now, also went to a rope and a pole, thoughe not in the same place where it is now, but where ye bridge is), or whither it toke name of ye qualitie of ye place, whiche standynge hyghe and open to the wethar is called Wyndesor, because ye wynd is sore and ye ayre very subtile and percynge there, as ye inhabitants fynde it, whiche etymologie devysynge with my selffe, of ye nature of ye place it selffe, I added anothar also thereto, *de situ loci*, at my fyrst comynge thethar of this effecte:—

> 'The wynd is sore, in highe Wyndsor, whereof it may take name,
> And Wynde, for wyndynge, may import assendynge to ye same,
> As eke the hawke is sayde to sore that lyethe on highe above,
> Of whiche etymologies, one the trewthe I guesse dothe prove.'"

When William the Conqueror was settled in England one of his first objects was to build strong castles in different parts of the country in order to preserve the power he had obtained. It is not known when Windsor Castle was first built or what its architectural character was, as no accounts are left, but it was in existence before the completion of Domesday Book in 1086. The site chosen by William for the castle was on the brow of a hill in the manor of Clewer, and about two miles north-west of Old Windsor. Neither the first nor the second William appears to have visited Windsor often, but Henry I. took a special liking to it, and greatly enlarged the castle. It is supposed that certain fragments in the Norman style which were brought to light during the progress of Sir Jeffrey Wyattville's improvements were relics of this building. Walter Fitz Other was the first governor of Windsor Castle, and was succeeded in his office by his son William Fitz Walter, who assumed the surname of Windsor. As the town grew up under the shadow of the castle the inhabitants had frequent cause to complain of the tyranny of the various constables. In 1273 the Royal Commissioners reported that Geoffry de Picheford, constable, "unjustly extorted great sums from the whole country, levied as his dues," and his conduct does not by any means appear to have been singular. When Byron described himself as standing on the Bridge of Sighs at Venice, he had "a palace and a prison on each hand," but our old kings appear to have had no objection to using the same building both as palace and prison. The Earl of Northumberland and some of his followers were confined in Windsor Castle in the reign of William Rufus, and this is the earliest notice of the castle as a state prison, which it continued to be until the close of the Commonwealth, and occasionally afterwards. Maud de Braose and her son were starved to death in Windsor Castle in John's reign; Treasurer Langton, bishop of Coventry and Lichfield, was confined here because he refused to supply Edward II. with money for the pursuit of his pleasures; King John of France, taken prisoner at Poictiers, was removed here from the Savoy, but he was treated more as a guest than as a prisoner, for "he was permitted to hunt and hawk, and take what other diversions he pleased, as well as the Lord Philip, his son." When Henry IV. took possession of the throne, he confined the Earl of March (then seven years old) in Windsor Castle, for the grave crime of having a better right than his own. The earl was descended from Lionel, Duke of Clarence, an elder brother of Henry's father, John of Gaunt. In the year 1405 Lady de Spenser undertook to liberate the child and his younger brother, who was with him. By means of false keys she obtained access to their apartment, and hurrying them out of the castle she led them towards the frontiers of Wales, where Owen Glendower was in arms against the king. News of the flight soon got abroad, and the fugitives were overtaken, but the unfortunate smith, "for making ye key lost fyrst his handes, after his hed." One of the first acts of Henry V. was to set the young prince at liberty. The most romantic of the imprisonments in the castle was that of James I. of Scotland. While standing at the window of his prison, "to see the warld and folk that went forbye," he saw walking in the garden below Jane Beaufort, daughter of the Earl of Somerset, and half-niece to Henry V. He often watched here, for he had fallen in love with the young lady, and his poem, "The King's Quair" (or Book), is largely devoted to her. He fondly describes the garden where he first saw Lady Jane, who became his wife before he returned free to his own country:—

> "Now was there maid, fast by the Touris wall,
> A gardyn faire, and in the corneris set,
> Ane herbere grene, with wandis long and small,
> Railit about, and so with treis set
> Was all the place, and hawthorn hegis knet,
> That lyf was non, walkyng there forbye,
> That mycht within scarce any wight aspye."

The tower referred to in these lines was situated on the south side of the castle, and south-east of the Round Tower or keep. It was called the Earl Marshal's, or the Devil's Tower, and was set apart for the custody of State prisoners. It was afterwards fitted up for the reception of the maids of honour, when it took the name of the Maidens' Tower. The accomplished Earl of Surrey, who spent much of his early life in the castle with his friend the Duke of Richmond (Henry VIII.'s illegitimate son), must not be forgotten as a prisoner also:—

> "So cruel prison, how could betide, alas!
> As proud Windsor, where I, in lust and joy,
> With a kinges son my childish years did pass,
> In greater feast than Priam's sons of Troy,
> Where each sweet place returns a taste full sour.
> The large green courts, where we were wont to hove
> With eyes cast up into the maidens' tower,
> And easy sighs such as folk draw in love."

These lines were written by Surrey in 1546, when he was imprisoned, in consequence of a quarrel and charges brought by him against Lord Hertford, the king's lieutenant-general in France.

We have already spoken of the additions made to the castle by Henry I., and we will now give a short notice of some of the chief alterations made since that time, and of the men who were employed upon them. A building of such size and importance as Windsor Castle requires constant attention, so that few reigns have passed without some important works having been carried out for its preservation, but our space will not allow us to do more than allude to the chief of these. Much was done in Henry III.'s long reign. In the year 1220 orders were issued for payment of money to Engelard de Cygony, the Constable, for the works at the castle, and in 1221 Engelard was ordered not to take the toll called *cheminage* from persons conveying timber to the castle for the building. In 1233 a new kitchen was built, and in 1236 the bridges of the castle were repaired. In 1256–7 considerable alterations were undertaken, but soon after were discontinued, probably for want of money, for in 1260 the sum of 410*l.* was delivered to Master John of Gloucester, the king's mason, to be distributed to the workmen, whose wages were two years in arrear. Edward III., after his foundation of the Order of the Garter, enlarged the castle almost to its present extent, and Stow relates the tradition that the king received the hint as to the direction of the new additions from the kings of France and Scotland, who were prisoners together at Windsor during part of the years 1356–7. The three kings were walking on the site of the Upper Ward, then a portion of the park, when "the strangers commending the situation, and judging the castle to have been better built in that place than where it was, as being on higher ground, and more open to see and to be seen afar off, the king approved their saying, adding pleasantly that it should so be, and that he would bring his castle thither, that is to say, enlarge it so far with two other wards, the charges whereof should be borne with their two ransoms, as after it came to pass."

In 1349 John Peynton was appointed surveyor of the works, and Richard de Rotheley superseded him in the following year. About this time very energetic endeavours were made to get on with the building. Masons and artificers of all kinds were pressed into the service, and John de Alkeshull had power assigned to him by the king to "seize in the kingdom of England, as well by land as by water, in whatever places as should seem fit to him, stone, wood, coal, timber, lead, glass, iron, and tiles and other necessaries" for the works. In 1356 a distinguished man appeared upon the scene, namely, William of Wykeham, then a simple "clerk" without any ecclesiastical preferment. He was appointed surveyor of the works, and received one shilling a day. The royal coffers at this time were not overflowing, and to Wykeham, in common with John Brokas and Edmund Rose, was given power to take some of the best beasts and oxen out of the king's park, and to sell them, in order to obtain money for the building operations at the castle. The Winchester Tower is more particularly associated with William of Wykeham on account of a tradition that he inscribed on the interior of one of the walls the words "Hoc fecit Wykeham." The king reading this legend as "Wykeham built this," remonstrated with the architect, but the latter explained the words to mean that the building made him. No trace of this inscription has ever been found, but Sir Jeffrey Wyatville perpetuated the anecdote by cutting the words "Hoc fecit Wykeham" in the ashlar work of the Winchester Tower. In the year 1366 the Round Tower, then called *La Rose*, was externally painted with various colours, apparently to imitate the flower of that name. William Burdon, the painter, was engaged upon the job for 123 days and a half, and during a portion of the time he had several journeymen painters working under him. They used 67 lb. of white lead, 12 lb. of verdigris, 18 lb. of red lead, and 8 lb. of vermilion, 22 gallons of oil, 9 lb. of varnish, and 1,400 leaves of gold. With such an expenditure of material it should have been very resplendent. Edward III. had to surmount many difficulties in his attempt to make Windsor Castle a magnificent habitation. During some years nothing could be done for want of money, and, when the works were in full swing, there were many obstructions continually arising: thus the metal-work was all executed on the spot, but forges and furnaces required fuel, and the king could get no coal nearer than the pit's mouth in Durham. No other sovereign rivalled Edward III. in his alterations of the castle until George IV. inaugurated the extensive changes made by Sir Jeffrey Wyatville.

The history of a palace that has been used by the Royal Family of England for 800 years cannot but be full of interesting associations, and, as might be expected, that of Windsor Castle teems with them. Prince Edward (afterwards Edward I.) was brought up here, and in the 26th year of Henry III.'s reign the sum of 200*l.* was ordered to be paid out of the Treasury to Hugh Giffard and William Burn "for the support of Edward our son and his attendants residing with him, in our castle of Windsor." In after years it became the favourite residence of his beloved wife Eleanor, and three of her children were born in the castle. Edward III. was born here on November 23, 1312, and in consequence he is often referred to as Edward of Windsor. He had a particular liking for the place, and called his seventh and youngest son William of Windsor. In 1361 Edward the Black Prince was married to Lady Joan "the fair Maid of Kent," in the chapel, and eight years afterwards his mother, the good Queen Philippa died at the castle. The memory of Richard II. (the Black Prince's degenerate son) is also associated with Windsor, for here his wedding festivities were held when he married Anne of Bohemia, daughter of the Emperor Charles IV., and here (not in London, as Shakspeare has it) the dukes of Hereford and Norfolk were called before a high court of chivalry previous to the trial of battle at Coventry. It is needless, however, to mention all the kings and queens who have been born or married, or have died in the old castle, and we will therefore hurry on to the reign of Henry VIII. The Princess Mary lived here for a time, and was much liked by the people about her, for she stood godmother to their children, and distributed her alms generously. It was probably here that she worked the great arm-chair she gave her father as a new-year's present. She had a female fool to amuse her, and in her privy purse expenses the payment of 4*d.* for shaving poor Jane's head is an item of frequent occurrence.

Wolsey intended to be buried at Windsor, and he commenced the erection of a stately tomb, about half of which was completed when he fell. It was the work of Benedetto, a Florentine artist, who began it in 1524, and received 4,250 ducats for his labour. Besides this sum 380*l.* 13*s.* were spent upon the gilding. What remained at the time of the Civil Wars was demolished by order of the Long Parliament, and in April, 1646, the statues and figures of copper-gilt were removed and sold for 600*l.* A sarcophagus of black marble remained neglected until the year 1805, when it was appropriated, and it now covers the bones of a greater than Wolsey; for it surmounts the tomb of Nelson in the crypt of St. Paul's. Of the recent conversion of Wolsey's Chapel we have recently spoken, and have shown its present magnificent aspect. Wolsey's master died at Westminster on the 28th of January, 1547, and was buried with great solemnity at Windsor on the 16th of February. The funeral procession took two days to reach this place, and previously an order was made "for the clearing and mending of all the highways between Westminster and Windsor whereat the corps should pas; and the noisome boughs cut down of every side of the way, for prejudicing of the standards, banners, and bannerols, and where the ways were narrow there were edges opened on either side, so as the footmen might have free passage, without tarrying or disturbing of their orders." Queen Mary kept her wedding at the castle, and Queen Elizabeth completed here in thirty days a translation of that favourite book of our ancestors, "Boethius de Consolatione Philosophiæ." The building owes to Elizabeth one of its most striking features, for it was she who formed the world-famed "Terrace." James I. was often at Windsor, and in 1606 entertained his brother-in-law, Christian IV., king of Denmark, "most royally" in the castle. Charles I. found here one of his prisons and also a last resting-place. Parliament voted that Windsor Castle should be kept ready for Cromwell's use, and the Protector occasionally visited it. Charles II. made it his habitual summer residence, and the want of accommodation for his court caused him to commence a more extended system of additions than had been made since the erection of the upper ward by Edward III. James II. astonished the inhabitants of Windsor by his conduct in respect to the Roman Catholic religion, and on the 3rd of July, 1687, he received the Pope's Nuncio, who "was conducted to the castle by thirty-six coaches, six horses each." William III. spent but little time at Windsor, as his principal residence was at Hampton Court; but in the latter part of his life he contemplated considerable alterations in the castle. Sir Christopher Wren was called upon to design a plan for its conversion into a more regular edifice with centre and wings, but happily the king died before he had an opportunity of spoiling the time-honoured castle. Anne was a favourite at Windsor, which she made her summer residence both before and after she was queen. Hampton Court and Kensington were the favourite palaces of the two first Georges, and during the reigns of these sovereigns Windsor Castle was merely kept in repair, but it again came into favour with George III. Although the latter king was greatly attached to Windsor, he lived but little in the castle, and built himself a residence opposite the south terrace. This house was completed in 1782, and cost nearly 44,000*l.* Forty years afterwards it was swept away, as a first step in the improvements that were then in progress. The design of making the castle the magnificent building it has since become originated with George IV. William IV. is not particularly associated with the place, and the numerous interesting associations of the present reign, must be passed over now with the mere mention of that death in the castle on December 14, 1861, which brought the heaviest grief to the widowed heart of her Majesty, and threw the whole country into mourning. The town of Windsor is naturally overshadowed by the grandeur of the castle; nevertheless it has interesting associations of its own. People of mark have lived in the neighbourhood, and Shakspeare has done it the honour of laying the scene of his one English comedy, the "Merry Wives of Windsor," in the old town. There is evidence of the existence of New Windsor as early as the twelfth century, and an order was issued, in the year 1214, to the constable of the castle, and to William Barbet, keeper of the royal apartments, commanding them to sell the king's wine at Windsor, and the bacon that appeared likely to spoil by keeping. The first charter on record was granted in the 5th Edward I. (1276), and in this same reign the first members for the borough were elected. Thomas de Shawe and Henry de Bedeford were sent as representatives to the Parliament held at London in 1302. So little, however, was the honour then coveted that each elected person had to find manucaptors, or sureties, that he would appear in Parliament on the day and at the place named in the writ. Among the names of eminent men who have represented Windsor, the most interesting to us is that of Sir Christopher Wren.

Windsor Forest was one of the noblest of those large tracts of country in which our early kings delighted to hunt. William the Conqueror is said in the *Saxon Chronicle* to have loved the tall stags as if he were their father, and he appointed a Warden of the Forest in the person of Walter Fitz Other, the constable of the castle. The warden and his foresters were fully occupied in seeing that the severe forest laws were not broken. The praises of—

> "Thy forest, Windsor! and thy green retreats,
> At once the monarch's and the muse's seats,"

were sung by Pope, but it is greatly changed since the poet's time, having been enclosed in the latter part of George III.'s reign.

The beautiful chapel of St. George, under the shadow of the mighty pile that towers above it, must not be passed by unnoticed, although its history and that of the Order of the Garter would require an article to themselves. It will be sufficient, however, to notice here that the original chapel was built by Edward III., and shortly afterwards falling into decay, the present one was commenced in the reign of Edward IV., and finished in that of Henry VIII.

Castle, chapel, forest, park, and town together form that Windsor which is one of the noblest showplaces in Europe, and better still, one of the centres of English history for many centuries.

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**National Health Society.**—According to the report just now issued, the Committee are very well satisfied with the past year's work. A number of useful lectures have been delivered in various parts of London. Miss Lankester, the secretary, can usually be found at the office of the Society, 63, Berners-street, by those who wish to assist.

## GWILT'S ENCYCLOPÆDIA.

THE fact that there should be a demand just now for a new edition * of this well-known and long-reputed work is, we may hope, an indication that, in spite of the apparent prevalent taste of the day, architecture has not in reality come to be entirely regarded as a mere matter of sentiment, and pretty drawing, and reproduction of the feeling of past styles. For to those who so regard it, a book like Gwilt's, in which the logical and scientific basis of architecture is so fully recognised and so completely exemplified, could hardly appear other than old-fashioned lumber. A business-like publishing firm, with a clear perception of trade interest, would not, however, be likely to commit themselves to an enlarged re-issue of a work, involving considerable expenditure, if they did not see a market for it; and the appearance of the seventh edition of Gwilt shows that a practical and scientific treatise of this kind has a permanent value, irrespective of any changes in mere architectural taste.

The amount of the additional matter in the recent editions, as compared with the work as originally issued, is roughly indicated in the reprint of the title-page in our note; we learn more particularly, from the advertisement to the new edition, that "the Tables of the English Cathedrals have been recompiled; many chapters on Public and Private Buildings rewritten, and new ones inserted; the List of Architects and their Principal Works has been removed from the Glossary and re-compiled; the List of Publications largely added to, and formed into a separate list; while the Glossary itself, during reprinting, has received numerous additional terms and illustrations, together with such amendments as appeared desirable."

To the elder section of the profession it is certainly unnecessary to say anything in regard to the scope and plan of the Encyclopædia. Even those who from their limited and purely sentimental view of architecture may undervalue it, are well aware of its position as what is called a "text-book," and have in most cases been through it as part of their curriculum. But we shrewdly suspect that to not a few of the rising generation of architects Gwilt is little more than a name, and that it will hardly be superfluous to bestow a little space in directing their attention to the contents of a work which has certainly this qualification in a pre-eminent degree, that it thoroughly corresponds with its pretensions. We can say for ourselves, as we have said before, that we have never referred to Gwilt for information on any point which ought to be included in its scope, without finding what we wanted, wholly or in part; and those who know the constant disappointment which attends research for special information in books which ought to contain it, know that this is no ordinary commendation to bestow on a work of reference.

Gwilt's Encyclopædia is fourfold in its general plan, treating separately the History, the Theory, and the Practice of Architecture, and the Valuation of Property. The Glossary of terms, and the list of books on architecture and of eminent architects and their works, form, in the present edition, separate and subsidiary sections. The incorporation of a section on valuation of property with the other sections on the study of architecture proper, and apparently on an equal footing of importance, would be in itself a matter for more than question with many of the most prominent champions of architecture at the present moment. If required to express a formal opinion on the question, from the standpoint of the present day, our judgment would be that such a branch of practice was most naturally included within the scope of the profession of the architect, who assuredly should, as far as possible, know everything and be able to pronounce an opinion upon everything that is directly connected with buildings; and that a knowledge of the points which affect the money value of a building only implies that kind of practical information which is an important part of the real basis of the profession. That one man cannot be equally a proficient and equally an authority upon every class of subject connected with architecture,—that if he has given much time to mastering the details which affect the value of property he is not likely to be equally master of ornamental design in its higher branches,—is very possible; but the dilemma has its counterpart in other professions. One lawyer is especially great in a special branch of law; one doctor is specially consulted for diseases of the eye, another for those of the heart, and so on. The attempt to shuffle off the burden of valuation, and its cognate studies, in favour of a more specially "artistic" view of the profession of architect, tends to deprive those who seek for reliable valuation of the services of the higher class of practitioners, and to leave the work to those whose status and education may not place them nearly so much above the reach of interested motives. On the other hand, the present tendency to lean so much towards the artistic theory of the profession has, we do not hesitate to say, been the occasion of not a little bad and what we should call sham art, evolved by those who think that an architect can be, in effect, sculptor and painter without going through sculptor's and painter's training. We may quote the precept and example of Sir C. Barry, who certainly was an Art-architect in the most correct meaning of the words, and who held a most decided opinion upon the direct duty of the architect in regard to acquiring every kind of practical acquaintance with building. Nor do we believe that a Mediæval architect or builder (whichever term we are to use) would have made any objection to pronouncing an opinion on the value of a building, if any case of inter-conventual litigation had rendered an authoritative judgment on such a subject desirable.

The History of Architecture included in the Encyclopædia cannot of course take place with some more recent historical work, either in extent or in power and suggestiveness of generalisation. Much has been learned, and some things unlearned, during the thirty-three years which have elapsed since the publication of the first edition. The collection of various ideas and theories as to the origin of the pointed arch it is curious to run through, now that we have finally settled down to the belief in its constructive and utilitarian origin. The inference as to the comparative importance of Gothic and Renaissance architecture, to be drawn from the tenor of their treatment in the History, will hardly meet the sympathy of many readers in the present day; but the impartial intention is manifest, and the inferior illustration of the Gothic style is partly due to the fact that a school of architecture in which constructive features play so large a part in the design is less easily illustrated by woodcuts showing the superficial aspect of the structure than is the less real and more artificially composed character of Renaissance architecture. The distinction between the style of illustration given here, and those with which the chief characteristics of Pointed architecture are illustrated in Viollet-le-Duc's *Dictionnaire*, is significant enough as marking the far clearer and more logical view of the genuine basis of the style given by the French critic. In short, the History is the least valuable portion of Gwilt, because its merits are of that kind which are necessarily superseded in time by the results of further research, and also, perhaps, we may add, because the great difficulty of finding a scheme by which so involved a subject as the history of architecture, with its varied ramifications in regard to time and place, and its connexion with race and manners, and culture, can be consolidated into a logically progressive and comprehensive whole, had hardly been adequately solved by Gwilt. As a first historical sketch for young students, however, preparatory to such larger works as Fergusson's, its value is unimpaired; and many of the remarks and passing criticisms in the course of the history are very comprehensive in their suggestions, such as the remark in comparing an illustration of Indian architecture (the Choultry at Madurah) with Greek, that an "examination of the details, and particularly of the system of corbelling over, destroys the charm which a first glance at it creates. In it the ornaments, which in Greek architecture are so well applied and balanced, seem more the work of chance than of consideration." This is an admirable though simple epitome of the distinction between the characteristic quality of Greek and Indian architecture, and a much more just valuation of the latter, to our thinking, than some later criticisms of a far more laudatory tone.

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* "Plumbing" is called "Plumbery" in the Encyclopædia; but though this construction is logically the same as "joinery," it is no use trying to disturb an expression which has been universally adopted. Besides why apply the rule only in this instance? To complete it, one would have to say "Paintery," "Gildery," &c.

These lines were written by Surrey in 1546, when he was imprisoned, in consequence of a quarrel and charges brought by him against Lord Hertford, the king's lieutenant-general in France.

We have already spoken of the additions made to the castle by Henry I., and we will now give a short notice of some of the chief alterations made since that time, and of the men who were employed upon them. A building of such size and importance as Windsor Castle requires constant attention, so that few reigns have passed without some important works having been carried out for its preservation, but our space will not allow us to do more than allude to the chief of these. Much was done in Henry III.'s long reign. In the year 1220 orders were issued for payment of money to Engelard de Cygony, the Constable, for the works at the castle, and in 1221 Engelard was ordered not to take the toll called *cheminage* from persons conveying timber to the castle for the building. In 1233 a new kitchen was built, and in 1236 the bridges of the castle were repaired. In 1256–7 considerable alterations were undertaken, but soon after were discontinued, probably for want of money, for in 1260 the sum of 410*l.* was delivered to Master John of Gloucester, the king's mason, to be distributed to the workmen, whose wages were two years in arrear. Edward III., after his foundation of the Order of the Garter, enlarged the castle almost to its present extent, and Stow relates the tradition that the king received the hint as to the direction of the new additions from the kings of France and Scotland, who were prisoners together at Windsor during part of the years 1356–7. The three kings were walking on the site of the Upper Ward, then a portion of the park, when "the strangers commending the situation, and judging the castle to have been better built in that place than where it was, as being on higher ground, and more open to see and to be seen afar off, the king approved their saying, adding pleasantly that it should so be, and that he would bring his castle thither, that is to say, enlarge it so far with two other wards, the charges whereof should be borne with their two ransoms, as after it came to pass."

In 1349 John Peynton was appointed surveyor of the works, and Richard de Rotheley superseded him in the following year. About this time very energetic endeavours were made to get on with the building. Masons and artificers of all kinds were pressed into the service, and John de Alkeshull had power assigned to him by the king to "seize in the kingdom of England, as well by land as by water, in whatever places as should seem fit to him, stone, wood, coal, timber, lead, glass, iron, and tiles and other necessaries" for the works. In 1356 a distinguished man appeared upon the scene, namely, William of Wykeham, then a simple "clerk" without any ecclesiastical preferment. He was appointed surveyor of the works, and received one shilling a day. The royal coffers at this time were not overflowing, and to Wykeham, in common with John Brokas and Edmund Rose, was given power to take some of the best beasts and oxen out of the king's park, and to sell them, in order to obtain money for the building operations at the castle. The Winchester Tower is more particularly associated with William of Wykeham on account of a tradition that he inscribed on the interior of one of the walls the words "Hoc fecit Wykeham." The king reading this legend as "Wykeham built this," remonstrated with the architect, but the latter explained the words to mean that the building made him. No trace of this inscription has ever been found, but Sir Jeffrey Wyatville perpetuated the anecdote by cutting the words "Hoc fecit Wykeham" in the ashlar work of the Winchester Tower. In the year 1366 the Round Tower, then called *La Rose*, was externally painted with various colours, apparently to imitate the flower of that name. William Burdon, the painter, was engaged upon the job for 123 days and a half, and during a portion of the time he had several journeymen painters working under him. They used 67 lb. of white lead, 12 lb. of verdigris, 18 lb. of red lead, and 8 lb. of vermilion, 22 gallons of oil, 9 lb. of varnish, and 1,400 leaves of gold. With such an expenditure of material it should have been very resplendent. Edward III. had to surmount many difficulties in his attempt to make Windsor Castle a magnificent habitation. During some years nothing could be done for want of money, and, when the works were in full swing, there were many obstructions continually arising: thus the metal-work was all executed on the spot, but forges and furnaces required fuel, and the king could get no coal nearer than the pit's mouth in Durham. No other sovereign rivalled Edward III. in his alterations of the castle until George IV. inaugurated the extensive changes made by Sir Jeffrey Wyatville.

The history of a palace that has been used by the Royal Family of England for 800 years cannot but be full of interesting associations, and, as might be expected, that of Windsor Castle teems with them. Prince Edward (afterwards Edward I.) was brought up here, and in the 26th year of Henry III.'s reign the sum of 200*l.* was ordered to be paid out of the Treasury to Hugh Giffard and William Burn "for the support of Edward our son and his attendants residing with him, in our castle of Windsor." In after years it became the favourite residence of his beloved wife Eleanor, and three of her children were born in the castle. Edward III. was born here on November 23, 1312, and in consequence he is often referred to as Edward of Windsor. He had a particular liking for the place, and called his seventh and youngest son William of Windsor. In 1361 Edward the Black Prince was married to Lady Joan "the fair Maid of Kent," in the chapel, and eight years afterwards his mother, the good Queen Philippa died at the castle. The memory of Richard II. (the Black Prince's degenerate son) is also associated with Windsor, for here his wedding festivities were held when he married Anne of Bohemia, daughter of the Emperor Charles IV., and here (not in London, as Shakspeare has it) the dukes of Hereford and Norfolk were called before a high court of chivalry previous to the trial of battle at Coventry. It is needless, however, to mention all the kings and queens who have been born or married, or have died in the old castle, and we will therefore hurry on to the reign of Henry VIII. The Princess Mary lived here for a time, and was much liked by the people about her, for she stood godmother to their children, and distributed her alms generously. It was probably here that she worked the great arm-chair she gave her father as a new-year's present. She had a female fool to amuse her, and in her privy purse expenses the payment of 4*d.* for shaving poor Jane's head is an item of frequent occurrence.

Wolsey intended to be buried at Windsor, and he commenced the erection of a stately tomb, about half of which was completed when he fell. It was the work of Benedetto, a Florentine artist, who began it in 1524, and received 4,250 ducats for his labour. Besides this sum 380*l.* 13*s.* were spent upon the gilding. What remained at the time of the Civil Wars was demolished by order of the Long Parliament, and in April, 1646, the statues and figures of copper-gilt were removed and sold for 600*l.* A sarcophagus of black marble remained neglected until the year 1805, when it was appropriated, and it now covers the bones of a greater than Wolsey; for it surmounts the tomb of Nelson in the crypt of St. Paul's. Of the recent conversion of Wolsey's Chapel we have recently spoken, and have shown its present magnificent aspect. Wolsey's master died at Westminster on the 28th of January, 1547, and was buried with great solemnity at Windsor on the 16th of February. The funeral procession took two days to reach this place, and previously an order was made "for the clearing and mending of all the highways between Westminster and Windsor whereat the corps should pas; and the noisome boughs cut down of every side of the way, for prejudicing of the standards, banners, and bannerols, and where the ways were narrow there were edges opened on either side, so as the footmen might have free passage, without tarrying or disturbing of their orders." Queen Mary kept her wedding at the castle, and Queen Elizabeth completed here in thirty days a translation of that favourite book of our ancestors, "Boethius de Consolatione Philosophiæ." The building owes to Elizabeth one of its most striking features, for it was she who formed the world-famed "Terrace." James I. was often at Windsor, and in 1606 entertained his brother-in-law, Christian IV., king of Denmark, "most royally" in the castle. Charles I. found here one of his prisons and also a last resting-place. Parliament voted that Windsor Castle should be kept ready for Cromwell's use, and the Protector occasionally visited it. Charles II. made it his habitual summer residence, and the want of accommodation for his court caused him to commence a more extended system of additions than had been made since the erection of the upper ward by Edward III. James II. astonished the inhabitants of Windsor by his conduct in respec to the Roman Catholic religion, and on the 3rd of July, 1687, he received the Pope's Nuncio, who "was conducted to the castle by thirty-six coaches, six horses each." William III. spent but little time at Windsor, as his principal residence was at Hampton Court; but in the latter part of his life he contemplated considerable alterations in the castle. Sir Christopher Wren was called upon to design a plan for its conversion into a more regular edifice with centre and wings, but happily the king died before he had an opportunity of spoiling the time-honoured castle. Anne was a favourite at Windsor, which she made her summer residence both before and after she was queen. Hampton Court and Kensington were the favourite palaces of the two first Georges, and during the reigns of these sovereigns Windsor Castle was merely kept in repair, but it again came into favour with George III. Although the latter king was greatly attached to Windsor, he lived but little in the castle, and built himself a residence opposite the south terrace. This house was completed in 1782, and cost nearly 44,000*l.* Forty years afterwards it was swept away, as a first step in the improvements that were then in progress. The design of making the castle the magnificent building it has since become originated with George IV. William IV. is not particularly associated with the place, and the numerous interesting associations of the present reign, must be passed over now with the mere mention of that death in the castle on December 14, 1861, which brought the heaviest grief to the widowed heart of her Majesty, and threw the whole country into mourning. The town of Windsor is naturally overshadowed by the grandeur of the castle; nevertheless it has interesting associations of its own. People of mark have lived in the neighbourhood, and Shakspeare has done it the honour of laying the scene of his one English comedy, the "Merry Wives of Windsor," in the old town. There is evidence of the existence of New Windsor as early as the twelfth century, and an order was issued, in the year 1214, to the constable of the castle, and to William Barbet, keeper of the royal apartments, commanding them to sell the king's wine at Windsor, and the bacon that appeared likely to spoil by keeping. The first charter on record was granted in the 5th Edward I. (1276), and in this same reign the first members for the borough were elected. Thomas de Shawe and Henry de Bedeford were sent as representatives to the Parliament held at London in 1302. So little, however, was the honour then coveted that each elected person had to find manucaptors, or sureties, that he would appear in Parliament on the day and at the place named in the writ. Among the names of eminent men who have represented Windsor, the most interesting to us is that of Sir Christopher Wren.

Windsor Forest was one of the noblest of those large tracts of country in which our early kings delighted to hunt. William the Conqueror is said in the *Saxon Chronicle* to have loved the tall stags as if he were their father, and he appointed a Warden of the Forest in the person of Walter Fitz Other, the constable of the castle. The warden and his foresters were fully occupied in seeing that the severe forest laws were not broken. The praises of—

> "Thy forest, Windsor! and thy green retreats,
> At once the monarch's and the muse's seats,"

were sung by Pope, but it is greatly changed since the poet's time, having been enclosed in the latter part of George III.'s reign.

The beautiful chapel of St. George, under the shadow of the mighty pile that towers above it, must not be passed by unnoticed, although its history and that of the Order of the Garter would require an article to themselves. It will be sufficient, however, to notice here that the original chapel was built by Edward III., and shortly afterwards falling into decay, the present one was commenced in the reign of Edward IV., and finished in that of Henry VIII.

Castle, chapel, forest, park, and town together form that Windsor which is one of the noblest showplaces in Europe, and better still, one of the centres of English history for many centuries.

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**National Health Society.**—According to the report just now issued, the Committee are very well satisfied with the past year's work. A number of useful lectures have been delivered in various parts of London. Miss Lankester, the secretary, can usually be found at the office of the Society, 63, Berners-street, by those who wish to assist.

## GWILT'S ENCYCLOPÆDIA.

THE fact that there should be a demand just now for a new edition * of this well-known and long-reputed work is, we may hope, an indication that, in spite of the apparent prevalent taste of the day, architecture has not in reality come to be entirely regarded as a mere matter of sentiment, and pretty drawing, and reproduction of the feeling of past styles. For to those who so regard it, a book like Gwilt's, in which the logical and scientific basis of architecture is so fully recognised and so completely exemplified, could hardly appear other than old-fashioned lumber. A business-like publishing firm, with a clear perception of trade interest, would not, however, be likely to commit themselves to an enlarged re-issue of a work, involving considerable expenditure, if they did not see a market for it; and the appearance of the seventh edition of Gwilt shows that a practical and scientific treatise of this kind has a permanent value, irrespective of any changes in mere architectural taste.

The amount of the additional matter in the recent editions, as compared with the work as originally issued, is roughly indicated in the reprint of the title-page in our note; we learn more particularly, from the advertisement to the new edition, that "the Tables of the English Cathedrals have been recompiled; many chapters on Public and Private Buildings rewritten, and new ones inserted; the List of Architects and their Principal Works has been removed from the Glossary and re-compiled; the List of Publications largely added to, and formed into a separate list; while the Glossary itself, during reprinting, has received numerous additional terms and illustrations, together with such amendments as appeared desirable."

To the elder section of the profession it is certainly unnecessary to say anything in regard to the scope and plan of the Encyclopædia. Even those who from their limited and purely sentimental view of architecture may undervalue it, are well aware of its position as what is called a "text-book," and have in most cases been through it as part of their curriculum. But we shrewdly suspect that to not a few of the rising generation of architects Gwilt is little more than a name, and that it will hardly be superfluous to bestow a little space in directing their attention to the contents of a work which has certainly this qualification in a pre-eminent degree, that it thoroughly corresponds with its pretensions. We can say for ourselves, as we have said before, that we have never referred to Gwilt for information on any point which ought to be included in its scope, without finding what we wanted, wholly or in part; and those who know the constant disappointment which attends research for special information in books which ought to contain it, know that this is no ordinary commendation to bestow on a work of reference.

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The chapter on drawing,—the "medium of expression,"—lays down views as to the primary importance of outline in drawing, and the futility of the process of setting students to learn to draw by indiscriminately copying from various drawings, which it is only necessary to refer to in order to notice how far the general truth of Gwilt's remarks has been in more recent days practically ratified by the practice of all schools of instruction in drawing that are worth the name. In reference to another point, the theory as to the mastery over drawing of every kind which is gained by a thorough knowledge of

* An Encyclopædia of Architecture,—Historical, Theoretical, and Practical. By Joseph Gwilt, F.S.A., F.R.A.S. Illustrated with more than 1,100 engravings on wood by R. Branston, from drawings by John Sebastian Gwilt. Revised, with alterations and considerable additions, by Wyatt Papworth, F.R.I.B.A.; additionally illustrated with nearly 400 engravings on wood by O. Jewitt, and nearly 200 other woodcuts. Longmans, Green, & Co. 1876.

* "Plumbing" is called "Plumbery" in the Encyclopædia; but though this construction is logically the same as "joinery," it is no use trying to disturb an expression which has been universally adopted. Besides why apply the rule only in this instance? To complete it, one would have to say "Paintery," "Gildery," &c.

figure-drawing, which has been pressed very strongly of late, the criticism of Gwilt is worth requoting. In his opinion,—

"All the inferences are false which usually are derived from the assertion that he who can draw the human figure will be able to draw any other object that is submitted to him for representation. The few men who can *faultlessly* draw the human figure as they see it may doubtless have eyes keen enough and hands true enough to repeat the minutest details so accurately that any comparison of a particular detail with the original shall be creditable to them; but these men have spent years in obtaining, besides delicacy of handling, that knowledge of anatomy which reminds them that such a muscle is in such a place, that here it overlaps another, that there it dies into a bone, and that consequently they have to mark the curves and angles which occur, for instance, six or seven times between the elbow and the wrist, &c." But, it is added, "the majority of men who can draw the figure tolerably well can draw nothing else equally correctly, for the reason that their attention has been given to the mechanism of the human form solely; the representation, by our best portrait-painters, of the accessories they introduce into their pictures, especially of architectural details, is almost without exception ludicrously inaccurate. . . . . The artist who wishes to give the effect of a suite of mouldings, or of a carved ornament, requires to know previously all the parts which compose the work. In other words, some men can pretend to sketch distant rocks, and yet miss the very features by which the outlines intimate the geological character."

The remarks as to inaccuracy in representation of accessories, in portraits, for instance, are certainly not so applicable to the present day as to the date of the Encyclopædia; but the line of argument and the inference from it, that a draughtsman requires to understand the construction of what he is drawing in order to represent it correctly, are incontrovertible. And upon this the suggestion is based that an architectural student should first learn to draw architectural detail and ornament in different styles, so as thoroughly to understand them, before mounting to the higher branch of figure-drawing. The real truth about the influence of figure-drawing upon promoting general power in drawing is stated sometimes in a way that is perhaps hardly correct. It is not that drawing the figure enables a man to draw anything else; but that the study of it renders any other class of drawing seem comparatively easy of acquirement. And it must be borne in mind that drawing, while it requires a knowledge of the object drawn, itself assists in giving that knowledge, and is thus, so to speak, a means and an end at the same time. Look at an architectural detail, even carefully, and you very soon forget its construction and minutiæ. Draw it carefully, and in the process you learn all about it, and remember it afterwards. And as the first business of the architect, so far as drawing is concerned, is to delineate architectural detail, it seems according to reason that he should adopt the process, in learning to draw, which will teach him most about that, and best enable him to sketch and represent it.

It is in the section on the Practice of Architecture that the Encyclopædia becomes to a certain extent out of date for the modern student. Some portions of this section might advantageously have been shortened, and some of the illustrations cut out; but on the whole it is better perhaps to retain these as they were, as landmarks of the progress of architectural practice. The list of eight axioms (p. 798), by which the designer is recommended to test his scheme, are very well worth the special attention of young architects: two especially among them are frequently transgressed, particularly in competition designs, "Let solidity be always real, and not brought to appear so by artifice"; and, "Let nothing be introduced that is not subordinate to the whole." One remark, which is given under the head of "Theory of Architecture," is (p. 792) so well and truly put, and propounds a truth so little remembered in contemporary architectural designing, that we will conclude our remarks on the new edition of the Encyclopædia by quoting this eminently practical piece of theory:—

"In ninety-nine cases out of a hundred, the student will find that a good distribution of his plan leads him, with anything like ordinary tact, to the composition of good sections and good elevations. . . . . Indeed, it is incontrovertibly true that distribution and disposition are the first objects that should engage the architect's attention, even of him whose great aim is to strike the attention by ornament, which can never please unless its source can be traced to the most convenient and economical distribution of the leading parts. Theorists may be laughed at, but it does not move us, or diminish our regret to see many architects without any other theory than that whereon, in an inverted position, their own wild fancies are grafted. If what we have stated be true, and, from the nature of things, we cannot imagine a controversy can arise upon our observation, the talent of the architect is to be estimated, as Durand properly observes, according to his solution of the two following problems:—

First,—For a given sum, as in private buildings, to erect the most convenient and suitable house for his employer.

Second,—The requisites in a building being given, as in public buildings, to erect it at the smallest possible expense.

An investigation of all the modes of accomplishing these desiderata can only be fully effected in a work of much larger extent than this; but we have, in the practical part of our volume, so prepared the reader, that he will not generally be at a loss in respect to the construction of a building, whatever its nature or destination."

To say that the concluding remark is fully warranted by the extent, variety, and accuracy of the information contained in the book, is at the same time to give the fullest explanation of the continued value and present re-publication of Gwilt's Encyclopædia.

## KNIGHTSBRIDGE BARRACKS.

THE public meeting which was held last Tuesday to protest against the rebuilding of the Knightsbridge Barracks on a portion of their present site possessed the elements of success, inasmuch as it appealed to the common sense of Londoners generally, and to that of the Government in particular. That the present barracks are condemned is certain; and that it is proposed by the competent authorities to widen the Kensington-road by selling a portion of the site upon which they are built to the Metropolitan Board of Works, is also certain. But we are disinclined to believe that the Government really intend to erect new cavalry barracks upon the limited and inconveniently oblong piece of ground which will be left after the high road is widened. It will be remembered that some twenty years ago a great barrack competition took place, in which many well-known architects assisted. The first premium of the Infantry section was awarded to Mr. George Morgan, who erected the buildings at present in use at Chelsea; and Mr. T. H. Wyatt received the first premium for the Cavalry section. With commendable justice the War Office have now commissioned Mr. Wyatt to plan and superintend the construction of the barracks intended to supersede those at Knightsbridge; and it is all the more commendable when it is remembered how architectural competitions, even Government competitions, sometimes terminate. But we venture to doubt whether Mr. Wyatt will do either justice to himself or to the building he is to erect if he be compelled to use the present inconvenient and restricted site. The Government say that the maintenance of cavalry barracks in that particular corner of Hyde Park is of strategical importance. But Lord Sandhurst the other day said just the contrary; and people very naturally laughed when Sir Harry Verney argued that "the peace of the metropolis would be considerably endangered if these barracks were got rid of." The resolution moved by Mr. Reginald Yorke, M.P., and seconded by Lord Headley, records, we think, the opinion of most Londoners who have considered the question; and it was carried by the meeting to which we refer:—

"That having heard the statement of General Lord Sandhurst that the presence of the Household Cavalry on the actual site of Knightsbridge Barracks is not essential to the maintenance of peace in the metropolis, and considering the great public improvement which could be effected by their entire removal, this meeting is of opinion that the proposal of the Government to reconstruct them on their present site is not only unnecessary, but also opposed to public interests."

The chairman, Lord Alfred Churchill, was ultimately requested to sign a petition to the House of Commons, begging the House not to grant money for the erection of new barracks on the present site; and we wish the petition the speed and attention it demands.

Indeed, at a time when the public advantage of the many improvements which are being carried out, both in the City and the Metropolis, is patent to all, the Household troops should not be permitted to bar the way to another. That 450 horsemen quartered in barracks which break a line of road forming one of the most important entrances to central London occupy that particular spot for the purpose of intimidating the uneducated portion of the community, is a bad argument! And is it the west end of London alone that contains a monopoly of uneducated people? It would seem so from the care bestowed upon its security and welfare. The great City guilds, the merchants' offices, the joint-stock banks, Threadneedle-street, indeed the whole City of London itself, are of such slight importance that a handful of soldiers quartered at the Tower is deemed sufficient protection! At the west end, on the contrary, a small portion of London is dotted with barracks which are filled with troops whose occupations west of Charing-cross consist in mounting guard at the Horse Guards, attending the Queen in her Majesty's visits to town, and walking up and and down in front of the public offices; while east of Charing-cross their only duty appears to be to provide a nightly guard to Drury-lane Theatre.

We cannot but urge that the inhabitants of Knightsbridge are doing a public service in suggesting not alone the removal of the barracks, but the demolition of that particular corner which at the present hour is an eyesore upon a great London thoroughfare,—and this not from any fancied faults of the soldiers themselves, but really from the accidents of tradition which have too long doomed that particular corner to be what it is, and must continue to be, unless a spur to improvement be given to the land and house owners of the neighbourhood by clearing away an obstruction, and opening out Hyde Park to the very edge of the high road.

## THE GERMAN ATHENÆUM.

THE German Athenæum (*Verein für Kunst und Wissenschaft*), 21, Mortimer-street, has monthly exhibitions organised by that section of the society which is devoted exclusively to painting and sculpture, but ordinarily these remain for only one night. The last exhibition of this kind comprises a selection of Mr. Carl Haag's water-colour paintings, studies, and sketches, illustrative of his artistic career from an early period to the present time, and the owners being found good-natured, it is being kept open for a week. As this week, however, ends to-day, Saturday, 11th, after which the works will be returned, it will be useless for us to do more than say that the collection consists of 88 frames, including all the studies made for his best known pictures, and that it must have advanced the reputation of this able and agreeable artist.

## THE HORUS MYTH.

AT the Victoria (Philosophical) Institute, on Monday evening last, a paper "On the Horus Myth in its Relation to Christianity" was read by Mr. W. R. Cooper. The author sought to prove that there were between the Christian and Egyptian religious ideas, some very striking resemblances, which could only be accounted for on the hypothesis of a pre-patriarchal revelation which was afterwards lost sight of. He then proceeded to analyze the Horus Myth, especially that portion which referred to the actions of Horus, the son of Osiris, as the Egyptian Redeemer, or rather Deliverer from the power of the Evil Being typified by the serpent, Apophis, and the hippopotamus, Typhon. The titles of the avenging Deity, such as "Beloved Son of his Father," "Eternal One," "Self Begotten," "Justifier of the Righteous," "Only Begotten Son," and "God the Son of God," were next considered, and it was shown that some of these epithets, while of the highest antiquity, did not necessarily embrace the ideas imputed to them in the religious commentaries of later times, especially after the contacts of the Egyptian Faith first with Judaism and afterwards with Christianity. Mr. Cooper then asserted that many of the errors of the Gnostics arose from the Egyptian Christians having, without due caution, pressed the analogy of the acts of Horus and our Lord into the service of religion,—an unwise proceeding which, though undertaken in good faith, and sanctioned by the metaphorical expressions of the early Fathers, chiefly of the Alexandrian Church, yet led the way to serious departures from truth, and a partiality for mystical expositions.

**Enlargement of the Gloucester Corn Exchange.**—At a special meeting of the Gloucester Town Council, held on the 3rd inst., from minutes which were read it appeared that there had been some differences between the Finance Committee and Mr. Medland as to the execution of the plans for the improvement of the Corn Exchange, Mr. Medland, as was understood, desiring to have some latitude in carrying them out, while the committee were anxious to avoid "extras." The council supported the committee's view. Mr. Moss pointed to the heavy sum charged for extras when the Eastgate Market was constructed, the flooring being at first left out of calculation. Explanations were given, and it was understood that no material variation would be made in the plans, and that no extras would be incurred without the consent of the committee.

## PROFESSOR E. M. BARRY'S LECTURES ON ARCHITECTURE.*

LAST week we considered the part which architecture is called upon to fill in our towns, as distinguished from the country; and I propose to-night to follow up the same subject by the aid of light thrown upon it by the past.

I have endeavoured to point out to you some of the complexities with which architects must now grapple, and which, in my opinion, are not likely to diminish. For these, as far as they relate to scientific exigencies, we must not expect antiquity to aid us; but we may, perhaps, gain something from the study of the manner in which architects of old addressed themselves to the simpler problems submitted to them.

The monuments of Egypt will not assist us in solving the question I am placing before you, namely, the province of architecture in modern cities; not that I doubt the value of Egypt as a teacher, but because the conditions under which her builders worked differed radically from our own. The Egyptian architect employed the maximum of material, disposed without regard to space. We, if our art is to be of public utility, must study the converse, as leading to the happiness of the greatest number.

We may wander on the banks of the Nile, and marvel at the remains, on all sides, of civilisation and of art, but we are not likely to imitate either. Take, for example, the Great Pyramid of Gizeh. As a permanent monument it is perfect, but a monument of what?—of mechanical monotony, of dreary waste of labour. There would be no difficulty in erecting another pyramid to surpass this one, and I almost wonder that some worshipper of the Past has not entered upon such a task. So much is often said of the mischief of machinery, that we may, perhaps, sometimes ask ourselves if there is not such a thing as profligate waste of manual labour; and to such a question the Pyramids seem to me to supply an answer. No doubt, a pyramid is a wonderful work, and illustrates the stage of civilisation at which its builders had arrived. The London and North-Western Railway is a work at least as wonderful; and if we look at it in the light of a specimen of nineteenth-century enterprise, it will not compare disadvantageously with the Pyramids. Considering the circumstances of the time, the mechanical difficulties attending the erection of the latter will appear to many of us more formidable than in the modern case; but in the case of the railway, the triumph of intellect is immeasurably more apparent; and if we compare the results of both, we find that one ministers at best to a morbid ostentation, while the other serves the wants, and ministers to the convenience, of millions.

It is, of course, true that in Egypt we meet with works of architecture, besides the Pyramids, which claim more respectful treatment at our hands, as works of art. In strictness, perhaps, the Pyramids are not works of architecture at all, for they represent mere building. The temples, however, come under a different category. Always striking from their massive grandeur, their æsthetic merits must be admitted within the circle of architectural art. No one, I think, will contest this, who has examined on the spot the acres of majestic ruins at Thebes, or Philæ, but the atmosphere and climate of Egypt affect the appearance of its architecture to so important a degree that its effect is hardly to be appreciated from drawings alone. This is perhaps more especially the case with the interiors, as, for example, the famous hypostyle Hall of Manepthah at Karnak. It is difficult to believe, from the plan and section before you, that this hall is the object of almost universal admiration; but so it is, and Mr. Fergusson has gone so far as to describe it as "the greatest of man's architectural works"; qualifying this, it is true, by the statement, that it is "such a one as it would be impossible to reproduce, except in such a climate, and in that individual style in which, and for which, it was created." To this qualification I entirely assent; and in it you will find one of the reasons why I started by saying that we must not expect aid from Egypt, at least, in any direct influence on our work of to-day.

If this be the case with respect to public monuments, still more is it so with domestic architecture. Not, however, that the latter may not have been beautiful. In all probability the æsthetic taste of the Egyptians did not stop at their temples. Their houses must, of course, have been slighter in construction, and more varied in materials, but they were doubtless examples of the same wealth and skill which produced their public buildings. But the same considerations of climate, and other circumstances, which affect the one, must prevent the other from serving as models to ourselves.

Passing from Egypt, therefore, what are the most interesting remains of ancient domestic architecture? We turn instinctively to Greece, whenever any architectural inquiry presents itself, and we have no difficulty in ascertaining the principles which they applied to their public works. Starting with a Doric order, of a massiveness only second to the columns of Egypt, the Hellenic architects gradually reduced the sturdiness of its proportions and details till it was merged in the grace of the Ionic, and the even more highly decorated Corinthian. Nothing that was touched by Greek hands but was refined by the process, and Athens became the home of all that was exquisite in poetry and art. It must, therefore, be a source of unceasing regret to the architect that we know very little of the domestic architecture of the Greeks. It cannot have failed to have been pervaded by the pure taste which marks all their artistic remains, and must have afforded us some useful lessons. It is possible, however, that the private dwellings of Greek citizens may have been less important than we might at first be led to expect; for their public life (in Athens, at any rate) was so absorbing, that we may imagine the Athenians assigning a secondary importance to private affairs, and devoting their means and talents to the decoration of the public monuments, in preference to their domestic architecture.

Whatever the cause, however, we are left very much in the dark as to the latter, and can form but imperfect guesses as to its forms and decorations. This circumstance is in itself enough to justify us in refusing to accept the theory of perfect regularity, which some have sought to impose upon us, as a necessary condition of Grecian art.

When dignity is required, a certain measured regularity is essential in all good architecture, particularly in cases where the actual size is small; but the Greeks were far from insisting on exact regularity in all cases, as is seen by the example of the Erechtheum, and we may assume that their skill was great enough to adapt their architecture to the varied wants of domestic life without losing that exquisite taste which marked their designs for even the simplest objects.

Dismissing now the speculation of what might have been in Greece, we turn to Rome, as her conqueror and successor. As the metropolis of art, and queen of the world, she had opportunities without a parallel. How she used them we know from the remains of her public works, her amphitheatres, aqueducts, arches, and temples. Whatever wealth, power, and advancing civilisation could effect, became the marks of Roman dominion, and although we may miss the refined taste of the Greeks, we must admire the energy and Imperial qualities of the Romans. Until lately, the remains of Roman architecture were chiefly confined, as far as Rome itself is concerned, to those of public buildings, but recent investigations have done something to increase our knowledge of its domestic architecture. Fortunately, however, for my purpose this evening, there is a richer mine of information on this subject, only partially worked, and daily yielding new and valuable treasures.

I allude, of course, to Pompeii, to which I propose this evening especially to direct your attention. Let us first deal with the general aspect of the city. Owing to the enlightened activity of the Italian Government, in prosecuting the work of excavation, it is now possible to penetrate into all the more important parts of the city, and thus to form clear ideas of the daily life and habits of its former inhabitants.

Pompeii is placed on an eminence, and doubtless owes to this circumstance its comparatively perfect preservation. More fortunate than Herculaneum, it was not destroyed by lava, but by ashes. The lava becoming hard, like stone, still holds the latter in its petrified grasp, whereas the loose ashes, under which Pompeii was buried, have admitted of easy removal, without injury to the buildings and works of art, which they have preserved to a great extent from the ravages of time. As regards the style of the Pompeiian remains, it is right here to remark that we are not dealing with a city of first-rate importance. It was only about two miles in circumference outside the walls, and we must not, therefore, expect to find in it the grandeur and variety which no doubt characterised the buildings of Rome, and other important cities. Owing to the extension of Grecian rule in the south of Italy, it may, however, be presumed that Greek influence affected greatly the forms of Pompeiian architecture, and we shall see, in detailed examination, that this was the case. Indeed, Pompeii might almost be called a Grecian, rather than a Roman city, and we may therefore obtain from it much of that knowledge of the domestic habits of the Greeks which, as we have already seen, cannot be obtained from their own artistic remains.

Many who now visit the ruins express surprise at the imprudence which could have planted such an assemblage of human dwellings on the slope of a burning mountain; but it is supposed that, for some centuries before the destruction of Pompeii, Vesuvius had shown no indications of activity, such as the catastrophe which subsequently overwhelmed it in the year 79 of the Christian era. Pliny's description of the latter shows us that it was a surprise of the most terrible character; and had it not been so, many of the numerous valuable articles found in the ruins would, no doubt, have been previously removed to a place of safety. There were some warning shocks of earthquake before the final eruption, and we find evidences of the effect of them in the excavated buildings generally, some of which were evidently undergoing restoration at the time of the final destruction of the city.

The first sign of the eruption is described as a black and terrible cloud, resting on the summit of the mountain. This gradually expanded, and rose like some vast palm-tree, and at length burst into streams of fire and vapour, accompanied by lightning, and a strong sulphureous smell. Streams of molten lava then rolled down the sides of the mountain, and showers of stones and ashes fell around it.

Herculaneum, nestling close to the foot of the mountain, was soon buried in molten lava. Pompeii being four miles distant, was covered by the cinders or ashes thrown up from the crater, as above described.

This circumstance explains the paucity of the skeletons discovered in the ruins, and the good state of preservation of the houses. A general flight of the inhabitants occurred, and the cinders were sufficiently cooled in their passage through the air, not to destroy utterly the buildings they enveloped.

In approaching Pompeii, we come first on the street of the tombs. This was the principal approach, and is believed to have formed part of that famed Appian Way which extended from Rome to Capua. Amongst the Romans, the construction and the care of the public roads were considered a matter of the greatest importance, worthy of the care of emperors. Their construction showed the massiveness which Roman work ordinarily displays. Many examples remain, and some of you are doubtless familiar with the portion of the Appian way which is still intact and well preserved, and in which you may now find the sightseer of the nineteenth century enjoying his afternoon drive amidst the ruins of Imperial Rome.

The large upper stones which form the surface of the road are not, perhaps, adapted to the delicate springs of the London coach-builder, but they are carefully jointed, and after the lapse of centuries are in their original position, and available for daily use. Great care was taken with the foundation, which was composed of layers of stones and gravel, and the roads once made must have lasted for ever. The streets of Pompeii are all paved in this manner. There were no drains, nor did those enemies of the modern road-maker, the gas and water engineers, tear up the surface as soon as it was laid, and drive to despair those who were responsible for its maintenance. Along the main approach to the city, we find the tombs, varying in style and taste, according to the idiosyncrasies of their founders.

As regards intramural interment, the Romans had reached a conclusion which we have but too tardily accepted.

In some places, and in very rare cases, the honour of sepulture in the Forum, or other public places, was sparingly permitted, as a mark of special distinction; but, as a rule, neither interments nor burning were permitted within the city. As a natural consequence, the monuments were also outside the gates, as we see in the Appian Way at Rome, and in the street of tombs at Pompeii. They were held in great veneration, and it does not seem to have been necessary to enclose them, or afford them any protec-



* Second lecture, delivered at the Royal Academy, on the 2nd of March, 1876.

tion, beyond that which their own sanctity supplied. Sumptuary laws restrained the extravagance of cost and epitaphs, into which a rich society is tempted to glide; and for slaves, and for the very poor, Horace speaks of an enclosed space at a distance as a "*commune sepulchrum*."

The Pompeiian street is about 14 ft. wide, and shows the ruts worn by the traffic. On each side are the monuments of those who had borne some office, and to whom the erection of memorials had been decreed on public grounds. The cemeteries for general use were further removed from the gates of the town.

The monuments display every variety of design and scale, from the simple altar or bas-relief to the more ambitious structure, which, being furnished with a door, permitted the sepulchral vases containing the ashes of the dead to be placed within, as in a temple.

We have lately had a revival of interest in these matters, and it is high time that we should see our way clearly in respect of them. In our great cities, the dead press upon the living. Cemeteries once suburban are now the centres of large populations. Air is poisoned, springs are polluted. I cannot enter now into the important questions which this state of things will readily suggest to you; but it is not without interest to observe how they were dealt with by the Romans, whose care for the ashes of their forefathers was a sacred and pious duty.

At the entrance to the city the street is spanned by an arch over the carriage-way, with two side-openings for foot-passengers. The archway was closed, when required, by a portcullis, and there was a second gate inside for greater security.

The walls are of solid construction, with large stones laid horizontally. Some of them are 4 ft. or 5 ft. in length. The upright joints are not accurately vertical, but incline more or less,—a feature not uncommon in Greek work. Some portions appear to have been patched, or repaired, in a different style, with rubble work or brickwork. The latter is arranged in the diagonal manner, known as *opus reticulatum*, another feature familiar in Greece.

The walls were double, and with a connecting arch formed ramparts about 20 ft. wide, and from 25 ft. to 30 ft. from the ground. Towers were constructed at intervals. They were about 30 ft. square, and projected 7 ft. beyond the general line of the outer walls. Battlements crowned the upper surface of each wall. These differed from the battlements of Mediæval castles, in having a special arrangement of plan, for the greater security of the defender. Each battlement was constructed of large stones, with a piece returned inwards, an arrangement which not only increased its defensive advantages, but also added to its structural solidity.

Having passed the walls, the street becomes closely lined, on each side, with houses and shops, possessing little or no architectural interest externally; for with the exception of their public buildings, the Romans do not seem to have cared to make their houses ornaments to the public streets.

In the Forum, to which the principal thoroughfares led, we shall find the public edifices which formed the chief adornment of Pompeii. In the Forum of Roman cities, as in the great square of modern towns, we expect to find those buildings which, from their devotion to public purposes, are open to all. The temples of the gods, the Basilicas, or Law Courts, the Senate-house, or Assembly-rooms, the public granaries, Treasury, and Government Offices, were all congregated in the Forum, as well as market-places, and porticoes for various trades and pursuits. These buildings are marked in the plans on my right.

It was not unusual to use the Forum, in the absence of an amphitheatre, for gladiatorial shows, and it was often in such cases surrounded by colonnades or porticoes, under and over which spectators might congregate. The colonnades also afforded an agreeable protection from the Italian sun, and served the same purpose as the arcaded streets, so common now-a-days in southern towns, to the picturesqueness of which they are no mean addition.

At Pompeii, the Forum possessed these colonnades. There were also theatres, and an amphitheatre, but these were erected at a later date than the Forum. The latter was undergoing repairs at the time of its destruction, and large blocks of marble partly worked, and evidently under the hands of the masons, were found among the ruins. It was evidently the centre of Pompeiian public life, which according to the Roman customs, was far more engrossing than with us. The streets leading to the Forum had iron gates at their entrances, to be closed at night, or in case of tumult. They would also have been useful in restraining and regulating the crowd, attendant on shows or public meetings. There had been an alarming earthquake in the year A.D. 63, and this had caused much damage to the temples and other buildings of the Forum. The consequences of this calamity and the alarm caused by it were so serious, that the abandonment of the city had been discussed; but after a time, confidence returned, and the Pompeians set to work to restore the public monuments, in ignorance of the possibility of the tremendous misfortune which was so soon to befal them.

It is difficult to be quite sure of the particular destination of each of the buildings which surround the Forum of Pompeii. Indeed, there is some reason to think that the works of restoration, which were interrupted by the eruption, were connected with some changes of arrangement, then in course of execution. As to the more prominent structures, however,—the temples,—little doubt can exist.

The grandest of these was at the northern end, and has been usually termed the Temple of Jupiter. Sir W. Gell thinks it was the senaculum, or place of meeting of the decemviri, and certain peculiarities of internal construction favour this idea. Such meetings were commonly held in consecrated places, and on this assumption, the edifice in question might have been both a temple and a senate-house.

It is by far the grandest piece of architecture in Pompeii, and in its original condition must have presented an imposing appearance. The design of Roman temples was so evidently borrowed from Greece, that it is perhaps as well to point out here some of the differences between the two types. The temple at Pompeii is a fair specimen of the Roman manner; and the Parthenon may be selected as an example of Grecian principles of design.

In the Parthenon, as you may see, the interior is surrounded by a peristyle, or colonnade, a feature of great beauty, where the building crowned an eminence, as at the Acropolis. The effect of colonnades, in such a position, and under the influence of the sunlight of the fair south, is, I think, sufficient justification for such a feature. It would also protect the inner wall from moisture, and from heat, as to which latter point it would serve the same purpose as the verandahs of India.

We know now how largely colour entered into the architectural compositions of the Greeks, and if the walls were painted (as probably was the case), the shelter and protection afforded by the colonnades must have been very valuable. They are scarcely wide enough to have allowed processions to use them with dignity or convenience, but their width is just what we should expect to find, on the protective theory. If they were deeper, they would have cast too large a shadow, and would have marred the effect of the paintings on the walls.

The climate of Greece was, as we know, favourable to the habits of a people who passed much of their time in the open air, and we are struck by the small space occupied by the cella, or covered interior, in the plans of their temples. It was natural that they should revel in external effects, regarding the sun as their best friend. By deepening the porticoes at the ends, and adding a second row of columns, the entrances were duly marked by an increased depth of shadow, contrasting beautifully with the lights and shade of the peristyle.

If we turn to the Pompeian structure we shall notice the changes introduced by the Roman architects, changes which, in an artistic sense, are not in themselves improvements. In the first place, the peristyle has disappeared. The temple, being surrounded by other buildings, was not an isolated structure, in the sense in which the Parthenon was, and it may be presumed that, in the middle of a town, ground for a site was not very readily attainable. The portico at the entrance was deeper, and more spacious, by reason of no inner columns being introduced. On each side the portico was flanked by triumphal arches, and the whole front was evidently designed with special reference to its position, and intended to be seen principally from the Forum. A surrounding colonnade would, therefore, have been, to a great extent, wasted. The interior was also very different from that of the Parthenon. In that example the cella is small, relatively to the whole extent of the structure. Here the internal arrangements have gained in importance. By the suppression of the side colonnades, space was obtained, and the cella has expanded to the whole width of the portico.

At the end furthest from the entrance there are three vaults, with a passage behind them, connected with a staircase. If the interior was used, as conjectured, for meetings of senators, these vaults may have contained records, or other valuables, and the staircase may have given access to the platform, or rostrum, from which addresses could be delivered to the people below. There is a similar arrangement in the Temple of Isis, which seems to have been one of the most fashionable shrines of Pompeii. The rites and ceremonial of the worship of Isis are enshrouded in mystery.

Another point of contrast between the two types of temples is height. At Pompeii, they are elevated on a podium, or, as we should call it, a basement. The temple-builders of Greece chose, as a rule, lofty and commanding sites for their buildings. It was not therefore necessary for them to seek to elevate the latter. Had they done so, the exquisite charms of repose and contrast would have been lost. All that was necessary was to give such a base to their work, as would prevent their columns from seeming to start unprepared from the ground. They were not fond of bases for their columns, for it was not until after the decline of the Doric style that this feature was introduced in the Ionic and Corinthian orders. We therefore find in the Parthenon no base, plinth, or podium. Three steps projecting slightly beyond the columns gave a foundation to the structure, about corresponding to the projection of the cornice. They were evidently proportioned to the general architectural effect of the building, with the same care which the Greeks showed in every detail of their work.

Repose and refinement, as the leading principle of Greek works, were attained by compositions which relied on width rather than height, just as power and energy are represented by the towering structures of Mediæval architects.

The Romans lacked much of the pure taste of the Greeks, and, building in the midst of crowded towns, they sought for an imposing character in their works by giving them elevation, so as to separate them from the meaner structures around them. A podium and flight of steps became consequently common expedients, and we find this exemplified in the temples of Pompeii. A further increase of height was obtained by the difference of the order of columns which they employed.

The Greek order, *par excellence*, is the Doric, of which the Parthenon is an example. It is true that the Greeks allowed a sparing use of the Ionic order, as at the Erechtheum, and it was doubtless found to adapt itself to some special conveniences, not admissible under the stronger Doric sway. The Corinthian order was not accepted until the decline of art had begun to show itself, and was only employed in structures of less importance than the great temples of the gods.

The height of the Doric columns of the Parthenon was about six diameters; that of the Corinthian columns of the Temple of Jupiter at Pompeii was about ten diameters, or the same as the order known as that of Jupiter Stator at Rome. The effect of the portico of the latter was therefore quite different from that of the Parthenon, apart altogether from the divergence of the details. The principle of its composition was not the same, for by it reliance was placed on height rather than on width.

It is clear that these deviations were the result of deliberate intention, and not of ignorance; for the Pompeians were, as we have seen, more Grecian than Roman in their extraction. Moreover, we find, near to the theatres, remains of a Greek temple which, though not of the purest type, yet sufficiently illustrates the principles of which I have been treating. It was placed, according to Greek custom, on an elevated site. It is not, however, of the Doric, but of the Ionic order, with columns about 8$\frac{3}{4}$ diameters in height. These have characteristic Grecian bases, without the lower square member which is met with in Roman examples. The volutes of the capitals are all angular. The restored elevation of the front before you will serve to explain the differences I have endeavoured to point out between Roman and Greek temples. The Greek temple at Pompeii was in ruins at the time of the destruction of the city, and little more than its foundations can now be perfectly traced; but, from our knowledge of the proportions which were usual in structures of this nature, and from the fragments of its architecture which have

been disinterred, we have little difficulty in discovering its general design.

The question of lighting temples is one of great interest, and on which there has been much diversity of opinion. Some have thought that no external light was admitted, and that artificial lights only were used, for greater solemnity; as we see at the present day, in shrines of great reputed sanctity in the East, and in some Roman Catholic churches. Others have suggested that there was a large opening in the centre of the roof, admitting light and air as by a skylight. It is easy, however, to see that such a plan would render it difficult to avoid external disfigurement, while it would also fail to protect the interior from rain and snow.

Mr. Fergusson has propounded a third theory, namely, that of a clearstory, with openings in the roof to allow light to pass through it. The Egyptian custom is in favour of this suggestion, for in many of their temples, as you may see, for example, at Karnak, such a plan of lighting is adopted, and with a very striking effect. You will be able to compare this plan with Mr. Fergusson's suggestion in the drawings before you, remembering that one represents fact, and the other theory.

That the Greeks were acquainted with Egyptian work there can be no doubt, and as they transferred the rites of Isis to their own soil, there is no great difficulty in supposing that they may have also borrowed some architectural ideas from the banks of the Nile.

It may, perhaps, be objected to the plan proposed that it is not quite consistent with the simplicity of the form of the roof, which would not readily suggest any complication of internal arrangements. There would also be some difficulty with gutters to carry off the water, and no evidence has as yet been discovered to show how this was effected.

We have seen that the temples of the Romans were used sometimes as places of assembly, and there is, therefore, in their case, a strong presumption in favour of their having been arranged to receive direct light and air; but I do not think this applies at all with equal force to Greek work. If we consider the small dimensions of the cellæ of Greek temples, there is no great difficulty, as it seems to me, in supposing that they depended chiefly on artificial modes of lighting. They were shrines for the safe custody of sacred statues of the gods, not places in which crowds could assemble, and any openings of the roof would have affected injuriously their protective qualities. The doors, being thrown open, would also admit a greater amount of light and air in a climate like that of Greece, than we can readily imagine in our land of fogs.

The simplicity of Greek principles of design must also be insisted on as a difficulty in the way of any suggestion that they employed elaborate contrivances. If they required light in their temples, the obvious course would have been to place windows in their walls, and this is precisely what was done at the Erechtheum, and also at Agrigentum. May it not well be the case that custom varied, and that some temples were constructed without that external provision for light and air which was thought necessary for others? At the Erechtheum the latter was doubtless the case, and the architect placed windows in the walls. May we not conclude that if they had been needed at the Parthenon they would have been supplied in a similar manner? The chief beauty of the Parthenon was the exterior, and it would scarcely be possible to arrange any openings in the roof which would not be more or less of a blot on its fair proportions.

Turning now again to the Pompeian temple, I think we must conclude that it was lighted by some such plan as those which I have just referred to. The interior was evidently a place of importance, and if used for assemblies, would require light and ventilation. From the great size of the portico, and the absence of any inner lines of columns, it would have been possible to partially light the interior from over the door, or by means of openings on each side. This would have the advantage of leaving the side walls unpierced, and thus susceptible of decoration; but as these latter are not surrounded by colonnades, and do not form a very important part of the design, I am inclined to think that side windows may have been placed here, in which case the interior of the temple would have had abundance of light and ventilation.

Leaving now the temples of Pompeii, we find that the largest building in the Forum is the Basilica. This is in accordance with Roman practice, for with them the temples were usually small, and the basilicas large and magnificent. The latter were used for matters of law, commerce, and politics, and it has been suggested that the Roman people cared a great deal for these things, and not very much for religion, a distinction typified in the differing principles of design applied to these two classes of their public edifices. To us, basilican architecture possesses a peculiar interest; for the basilicas having been the first buildings appropriated to Christian worship, they may have affected more or less the arrangement of Christian churches, throughout the world, and up to the present time. The basilica at Pompeii must have been both important and handsome. There are twenty-eight columns in the interior, about 3 ft. 7 in. in diameter, and 34 ft. in height. These supported the roof, and at the sides were windows for the admission of light. The roof was of wood, of simple construction, terminating in a pediment at each end.

In the chief basilicas with which we are acquainted, there was at one end a semicircular apse, nearly corresponding in width with the central space, or nave. This, which subsequently became the Christian chancel, was the place reserved for the magistrate. It was raised above the general level of the floor, and from his elevated position, he could preside with dignity and order. He was surrounded by his officials, and in front of his seat an altar was placed, so that all the solemnities of sacrifice could be invoked whenever desired.

This arrangement was common to the basilica class, and was carried out with more or less magnificence, according to circumstances. The splendid ruin known as the Temple of Peace at Rome, is perhaps the grandest example of these buildings, and the basilica at Pompeii is a good specimen of those of a more unpretending character. In the latter, we do not find the usual semicircular apse, but in its place there is a rectangular recess, or tribune, which served the same purpose. The tribune was raised, and had beneath it a vault or cellar, which may have served as a treasury or book-room, or have been used for the temporary custody of prisoners. Stairs at the sides of the tribune gave access to galleries.

There can be no doubt that the Romans attached great importance to the due administration of justice. This is an attribute of an imperial race, which, conscious of its strength, does not fear to be just. It was not the manner of the Romans, we read in our New Testament, to deliver any man to death until he had met his accusers face to face. Here, at Pompeii, the basilica was evidently the most important building, if we except the amphitheatre, and we can form a notion of its imposing character if we picture to ourselves the presiding judge surrounded by his assessors, officers, apparitors, and lictors, elevated above the people, and swearing upon the altar before him, to deliver judgment, without fear or favour, and do justice between man and man.

Close to the basilica, and occupying the end of the Forum, opposite to the Temple of Jupiter, are three buildings, the destination of which cannot be decided with certainty. They may have been connected with the Government offices, and have served for a treasury, or other similar purpose, or they may more probably have been the Curiæ, or law courts,—a conclusion favoured by their propinquity to the basilica.

On the south side of the latter, we find a second temple, smaller than the Temple of Jupiter, and supposed to have been dedicated to Venus. It is surrounded by a spacious enclosure, entered not only from the Forum, but from the street. Inhabitants of Pompeii could therefore obtain admission by the latter, when the Forum was closed by the iron gates at the ends of the approaches.

The statues and pictures here found indicate corruption of taste and morals, and belong to the time when the Romans sought in the mysterious and degrading superstitions of Egypt, stimulants which were only too readily assimilated by them in the debasing rites of Isis, Bacchus, and Ceres.

The temple itself is small, and the cella served as a shrine for the statue of the goddess, whose pedestal was found within it. No columns, or surrounding porticoes, have been discovered, and it seems probable that the temple was undergoing restoration. It stands according to the usual Roman manner, on an elevated basement, raised, by sixteen steps, above the pavement of the enclosure. This basement is so much larger than the cella requires, and the latter appears so bald and unornamented, that I have no doubt there must have been surrounding colonnades, after the Grecian custom, and I have therefore restored the same on half of the plan before you.

The columns may have been temporarily removed, in order to effect changes in their material or design, and this suggestion is the more probable, because we know that the columns of the porticoes around the enclosures had actually been so modified. At the time of which we are treating, the old worship of the gods was neglected for the more exciting rites I have already mentioned, and we may suppose that while the Temple of Jupiter represented the older and more respectable *régime* of Church and State, the youth and fashion of the day found for themselves a more congenial worship in those temples, which, like that of Venus, lent itself more readily to the newer tastes of the day.

If this were so, we should expect to see fashion, with her usual restlessness, anxious to change the older forms of the architecture, and to aim at that ever-sought desideratum of false taste, to make all things new.

We accordingly find, that the alterations in course of execution were, architecturally, of an objectionable description. The columns around the enclosure were originally of stone; they were being repaired, and altered with plaster. Their design was Doric, of a Greek type, less than six diameters high. This proportion is quite unsuited for a Corinthian order, which requires nine or ten diameters for its right effect. Nevertheless, the Pompeians were engaged in converting these sturdy Doric columns into a dwarfed and corrupted Corinthian. They plastered over the Doric capital with acanthus-leaves and volutes, and continued the latter downwards, at the expense of the shaft of the column, which thus was stunted and disfigured. Variety was sought both in design and colour; but it was variety uncontrolled by taste. The columns were painted yellow and white.

Such as it was, the Temple of Venus was probably the fashionable temple of Pompeii, and may be understood to represent the prevailing taste of the people at the time of the destruction of their city. The Temple of Isis was in the neighbourhood of the theatres, and there is only one other temple in the Forum. This is opposite to the Temple of Venus, and consists of an open enclosure, with a small niche for a cella, just large enough to contain a statue. It is supposed that this edifice was the Temple of Mercury. Adjoining it is a spacious building, which may have been used for meetings; it is about 80 ft. square. It is often called the Senaculum, and was furnished with an altar. It had a fine portico of eight columns of white marble. Another building, which goes by the name of the Edifice of Eumachia, may probably have served as a second basilica or exchange.

The street near to the buildings above described leads to the theatre quarter, and to this we may now turn our attention. We have seen that Pompeii may be regarded to a great extent as a Grecian city, and this characteristic comes out the more strongly when we proceed to examine the remains of her theatres. The Romans attached less importance to these structures than was the case with the Greeks, amongst whom the stage had a semi-sacred character. To the Romans, the terrible sports of the amphitheatre were a greater attraction, and here they would assemble in their thousands, to see men fight to the death, or be torn to pieces before their eyes by ferocious wild beasts. Nor was this dreadful taste confined to the lower orders, or to the sterner sex, for each order of society had its appointed seats, disposed in zones, and here might be seen patrician and plebeian, stern warrior and fair lady, so that a crowded amphitheatre was a complete epitome of Roman society. We shall presently find that Pompeii possessed an amphitheatre of much grandeur, situated apart from the theatres which we are now considering.

The large theatre was of the ordinary semicircular plan, and was uncovered, except as regarded a few benches in the uppermost tier or gallery. The seats, originally open to all, had gradually been appropriated, and at the time now referred to were allotted by law to various sections of society. At Pompeii, three great divisions are traceable in the great theatre, besides that for the orchestra. The lowest was the place of honour, and the seats in it were arranged with ampler space accorded to them than in the upper tiers. Here were the magistrates, priests, and other important personages, each, it s sup-

posed, in his separate chair, displaying, probably, the insignia of his office.

The middle tier was for those of lesser degree; the seats in it were probably undistinguished, and they are believed to have been furnished with cushions. The people, in its wider sense, occupied the upper and outer zone, on stone benches or steps.

The only part that was permanently covered was a small part of the highest gallery, which was sheltered by a roof projected slightly from the outside wall. The whole of the interior was doubtless temporarily covered during the performances with an awning, or velarium, extending over the whole area. Attached to the theatre was a large square, with surrounding arcades, to which the audience could retire for change and refreshment, or for refuge in case of bad weather. The stage was of wood, and was consequently destroyed, though its position and form can be distinctly traced. It had a space below it, for machinery or other contrivances. It was probably covered over, for at Herculaneum, where there is also a theatre, remains of woodwork were found, embedded in the lava, which, from their position, must have formed part of a roof, and probably also machinery for producing scenic effects. The stage, or proscenium, was architecturally treated with columns, niches, and other ornaments, for the device of changing scenery was not known to antiquity. Those of you who may have seen Palladio's restoration of a Roman theatre at Vicenza will be in a position to apprehend clearly this part of the subject. The proscenium at Pompeii is too far ruined to allow its original design to be very clearly seen, and I have therefore placed before you a drawing of the proscenium in the theatre of Herculaneum, which is better preserved, and will enable you to understand the usual nature of such structures. Behind the stage was the post-scenium, or, as we might term it, the green-room, to which the actors retired, often, we may presume, not without trepidation; for the Romans, cruel in their sports, had little pity for want of success, and actors who had failed to please were sometimes publicly whipped in the open square near to the theatres. The musicians were placed in the front of the stage, and there seems to have been some contrivance for raising a screen when required, to conceal the stage, and to serve the purpose of the modern curtain, or drop-scene. Separate entrances gave access to the different orders of seats.

The Pompeians had followed the Greek custom of open theatres; but it may be supposed that these were not always convenient in winter, even in Southern Italy, and they therefore provided themselves with a smaller theatre, which was roofed in. We know that this was the case, from an inscription having been found in it to the effect that Marcus Portius, by a decree of the decemviri, superintended the erection of a covered theatre. It is much smaller than the great theatre, being about 90 ft. square, but it was similarly arranged, though with somewhat greater scenic facilities, as far as the stage was concerned. It had also its privileged seats, and its separate entrances, and had a ready communication with the great square.

This square commonly goes by the name of the Soldiers' Quarters, and in the rooms around it were found skeletons of prisoners, confined by iron fetters, which had caused the poor wretches to await their doom, while the gaolers saved themselves by flight. The architecture of this square is of a rough description, the columns being of coarse stone, covered with stucco, and coloured blue, red, and yellow.

At the upper end of the theatre is the Temple of Isis, before adverted to. In it a beautiful statue of the goddess was found. It is of marble, finely carved, and about 2 ft. high. It is now, with innumerable other objects found at Pompeii, in the museum at Naples. The drapery was coloured (it is believed, a tender purple), and portions were enriched by gilding. The statue holds the well-known Egyptian symbol of the key of the Nile. Many other works of art were discovered in this little temple, and among them, figures of Harpocrates, Bacchus, Venus, and Priapus. The walls were painted, and otherwise ornamented, and the exterior was evidently a favourite with the Pompeian people. The temple itself was raised on a podium like the others in the Forum. It had a portico of six columns, and behind the cella was a passage, supposed to have been used by the priests for some of the tricks of superstition with which they have been credited.

Translated from Egypt they were evidently thought likely to corrupt faith and morals; for in the year 57 B.C. they were forbidden by the Roman Senate. Nevertheless, we find them at Pompeii, and it would appear that they were winked at by the local authorities, whose independence of the central power was very considerable. The worship of Isis was probably the most superstitious of its day, and superstition must ever have its votaries. It is, moreover, thought to have afforded a cloak for licence and debauchery, and in the secret stairs leading to the backs of the niches, ready means existed for enabling the priests to personate the goddess, and deliver such oracles as they thought most conducive to their own interests.

In one corner of the enclosure there was a sacred well, with an altar before the door. The well was covered by a small building, decorated with bas reliefs, indicating the sacred character of the water within. Holy wells have never wanted worshippers; they have been common in all ages, and have not yet lost their reputation, as may be seen in the South of France, in the present day.

There are various other altars or pedestals for statues within the enclosure of the Temple of Isis, and in it was found the well-known tables of hieroglyphics now in the museum at Naples. The rooms near to the well probably belonged to the keeper of the temple, who was also a priest. Prayers were said twice a day, and fire and water were used at the solemn rites. The temple was closed at night.

Near to it are the ruins of another building, supposed to be a Temple of Æsculapius. From its out-of-the-way position it was probably not much frequented. Possibly the Romans thought more of the art of killing, than that of healing. The cella contains a pedestal. It had a portico in front of it, approached by a broad flight of steps. On the altar in front were found terra cotta statues of Æsculapius, Hygeia, and Priapus.

On the other side of the Temple of Isis, and near to the entrance to the theatres from the street leading from the Forum, were the schools. Here it was that the philosophers taught, and that each opposing system commended itself to its disciples. We know how important an influence this was in Greece, whose fierce democracies were wielded at will by the heaven-taught orator. In Roman society, the power of the schools was less, for they came in contact with a strong Government, which ruled with Imperial sway, and an iron power of centralization. Nevertheless, the schools of Pompeii doubtless played an important part in the life of the day. The orators first used the porticoes of temples for their rostra, and addressed their disciples standing around. This being found inconvenient, special buildings were in process of time set apart for schools, and to them children and young people of the highest rank, as well as others, resorted for instruction. They were usually near to the Forum, but at Pompeii this was already appropriated. Placed close to the theatres, the latter was readily available for illustration or declamation, and the open spaces around were convenient for the crowds of disciples who resorted hither, to hang upon the words of their favourite teachers.

In the courtyard of the schools was the pulpitum, or raised rostrum, from which the instructor addressed his pupils, just as did the Mediæval preachers from the open-air stone pulpits, of which we find many traces in our own country.

Time warns me to conclude, and I will only refer for a very few moments to the great amphitheatre. This is at the extremity of the city, and is of large size. It is oval in form, and contains twenty-four rows of seats, which might have contained some 10,000 people. There is nothing to call for special notice in its design, which is similar in character to the examples at Verona and Rome. It was to this amphitheatre that Pompeii poured out its thousands, on the very eve of the destruction of their homes. The shows were a matter of state concern, and the authorities were severely blamed if they failed to provide the much-prized and sanguinary amusements expected of them. Hundreds have been butchered in these bloody Roman amphitheatres before the eyes of those who no doubt passed for the refined, the delicate, the cultured classes of society.

We may imagine the consternation which spread among the vast multitude, savagely intent on its own amusement of watching the death agony of others, when first roused to an idea of their own peril. Hidden from them, for a time, by the velarium, the eruption of the burning mountain was not visible at first. A terrible darkness presently set in, to be followed only too soon by streams of fire and showers of burning cinders, amidst which the affrighted populace sought their homes, if haply they might find them standing.

Here I will close my examination of Pompeiian remains till next week, when I hope to refer to the light thrown by them on the private houses of the Romans, and to consider some of the points affecting the same questions amongst ourselves.

## THE ST. GOTHARD TUNNEL.

THIS remarkable work, notwithstanding all discouragements, is steadily approaching to a prospect of completion. From the outset it was foreseen that for many years, a large capital, and extreme energy, would be required for the fulfilment of the enterprise,—one more difficult, in several ways, than the tunnelling of Mont Cenis. It may, perhaps, be remembered that the project was originally planned more than fifteen years ago, while the undertaking was actually commenced so late as the autumn of 1872, when a contractor undertook to pierce a granite mountain 17,000 yards in thickness, before the Christmas of 1881. We have heard of many impediments and disasters in the course of the undertaking, of unexpected water, mud, and gravel, in addition to the enormous stone masses, of the advanced and lateral galleries converted into living streams, and of barriers resisting for a time even the most powerful blasts; but, simultaneously, new methods of drainage and new perforating tools have been applied, and the chances of success are not in any appreciable degree diminished. With regard to the latter, however, the improvements upon M. Sommeillier's apparatus, described in our notice of the Mont Cenis Tunnel, are simply matters of mechanical detail. But the salient interest of the subject consists in the determination of modern engineers to perforate that mighty rampart which Nature has thrown up, as if for the isolation of Upper Italy. This, in the case of France, has been broken through by the Mont Cenis Tunnel. In the case of Switzerland, a railroad over the Brenner Pass was at one time considered sufficient, and not of Switzerland alone, since, geographically speaking, North-Eastern France, Baden, Wurtemburg, Rhenish Prussia, Belgium, and Italy, were included. Mont Cenis, for these purposes, was too near Marseilles, and Brenner too near Trieste. It was essential, then, to open a new passage between these, across, or, if possible, through, the Helvetic Alps. Numerous were the suggestions as to the line which should be followed,—the Simplon, the Grimsel, the Lukmanier, the Septimor, and the Splugen, or old postal road; but a preference was ultimately given, by the most eminent authority, to the St. Gothard, which connected Lucerne and the valley of the Reuss with that of the Ticino. To begin with, only a few engineers, of a peculiarly dauntless spirit, contemplated an excavation through that huge range of rock; the more timid were in favour of a climbing and winding way, with tunnels here and there. It was shown, however, that avalanches, shiftings of surface, frost, snow, and other natural circumstances, must blockade the line during several months of the year, and then the idea of a tunnel took more solid shape. Above a certain altitude, in fact, an open route was demonstrated to be worthless, and the example of Mont Cenis strongly encouraged a different suggestion. The Messrs. Beckh & Gerwig undertook to supply the calculations; their data, after a long delay, have been acted upon, and the result promises to be another triumph of nineteenth-century engineering. The St. Gothard is a mountain mass, situated between the cantons of Uri and Tessino, in Switzerland, with an elevation varying between 6,000 ft. and 7,000 ft. Over it lies the immemorial line of communication between Switzerland and Italy, and hence the reason, among others, for its preference. The actual tunnel is to be from Fluelen to Biasca, on opposite sides of the range; and here, it may be said, is the nucleus of the entire Alpine system, whence the waters of the melted glaciers flow at once towards the North Sea, the Mediterranean, and the Adriatic. It is not our task to examine its military importance, though this has often been tested by history; but it may be remarked that, in every direction, inferior excavations branch, which, in the course of years, must feed the enormous perforation now in progress. This begins at a point moderately raised above the

level of the sea, and terminates almost upon a level with it, although a considerable ascent and decline occur between the two orifices. It was evident from the first that the greater the altitude the shorter need the tunnel be, and that, supposing altitude to be no element in the question, there need not be a tunnel at all. But the problem was, as we have observed, how to get free from the effects of climate. The snow-fall on St. Gothard, in the months of January, February, March, and November, varies from 13 in. to 35 in. a day, and the permanent deposit from 7 ft. to 17 ft. Strangely enough, this is regarded as a far more serious peril than the avalanches. The avalanches, like the lava of Mount Vesuvius, have worn and traced for themselves ways and paths of their own, which they seldom transcend, and very frail protections are sufficient; the open line is easily isolated; but it is far different with the falling snow. At a lower elevation, such as the engineers have chosen, the tunnel is free from nearly all these objections and difficulties. Again, though the rock is more hard, the implements are superior, and the possibility of driving downward shafts does not seem so hopeless. Supposing, indeed, that the obstacles of climate and of geological formation are surmounted, there still remain complications which did not embarrass the Mont Cenis engineers, who worked from one face of the mountain to another, in a straight line, and met in the centre, with mathematical exactitude. In the heart of St. Gothard there must be, besides gradients more or less severe, large and sweeping curves, landing-places, leading from the dark stations to positions outside the hill, and even zig-zags, to overcome stupendous mechanical obstructions. Nevertheless, Messrs. Beckh & Gerwig, now that the works have progressed so far, profess themselves as entirely confident, and predict that the achievement will, taken for all-in-all, eclipse the tunnelling of Mont Cenis. They had to commence operations, no doubt, with the aid of imperfect surveys; but this deficiency was speedily remedied, and there is not a height or a distance, from Fluelen to Biasca, that has not been scientifically measured. And they report, in the latest official documents,—"That which characterises the tunnels of the Alps is less the extraordinary length necessitated than the circumstance that they must, in most instances, be executed without shafts." This was recorded with reference to the tunnels of La Nerthe, the Marseilles and Avignon Railway, the Credo, Blaisy, and the Bellegarde routes, and the Alexandrian and Genoese line. But, with all the ingenuity of the engineers, the question of piercing some particular mountains was never left, either in the case of Mont Cenis or in that of St. Gothard, to *les procédés ordinaires;* on the contrary, the French engineers found, as their genius always finds, a new process sufficient for their purpose. The Sommeillier method, as applied to Mont Cenis, was directed, principally, to mechanical perforation, accelerated by the opening of transverse galleries, in assistance of gunpowder explosions and other processes, quite inapplicable to the physical necessities, yet altogether apart, in a tunnel-maker's point of view, from the Mont Cenis principle. This tunnel, it will not have been forgotten, has been advanced, practically, through only one-fourth of the stages reaching towards its completion. If we enter the dismal caverns of the mountain,—so far dark and hitherto undiscovered hollows of the earth,—we find a world of mystery and perplexity, by which even the engineers of the tunnel confess themselves confounded. The work is going forward surely, but slowly, and the tunnel will be monumental of the century, before the year 1881 has arrived and gone.

## "THE TREATMENT OF SCIENTIFIC ENGINEERING ARTISTICALLY."

### ARCHITECTURAL ASSOCIATION.

AT the ordinary fortnightly meeting of this Association on Friday, the 3rd inst., Mr. H. C. Boyes, vice-president, in the chair, the following new members were elected, viz.:—Messrs. A. Greenwood, C. J. Smithson, H. Paterson, H. N. Wilkinson, and F. Fusedale. A hearty vote of thanks was tendered to Messrs. Cubitt for permitting the visit to their works of the members of the Association, as recorded at some length in last week's *Builder*. It was announced that to-day (Saturday), the 11th, a visit would be made to the Church of St. Agnes, Kennington Park, now in course of erection from plans by Mr. G. G. Scott, jun.

Professor Kerr then proceeded to lecture on "The Treatment of Scientific Engineering Artistically." He said he wished his hearers to regard the subject as being entirely practical and utilitarian, as he had no intention of going into questions of art, or speculations of any kind, more than might be absolutely necessary. His purpose was to lay before them, briefly and yet comprehensively, the general question, as one of exercise for their own minds, why the work of the engineer should not be as artistic as the work of the architect, and the supplementary question as to the direction which efforts intended to improve engineering works in respect of art ought to take. Addressing a body of architectural students, and some who were more than students, it was scarcely necessary for him to point out that the essence of architectural artistic design was the "beautification" (if he might be allowed to use the word in a comprehensive sense) of building construction. Without construction there could be no genuine architectural art; and, properly and philosophically speaking, apart from construction there was no architectural design. The architectural profession had been in existence, if history might be believed, for four thousand years,—not precisely in the form in which it was represented by his audience, but in such a form as to entitle them to consider themselves as the legitimate and direct representatives of a long and continuous succession of men who had devoted themselves to the artistic designing of buildings upon principles derived by express education. Now, it could not be denied that the building of the engineer was the same as the building of the architect, although on a largely-extended scale, for where the architect built an arch, the engineer built a bridge; where the architect constructed an ordinary roof, the engineer constructed some enormous vault of several hundred feet span; and where the architect used a box iron girder, the engineer used a tubular bridge. But the materials used by both architect and engineer were precisely the same; the workmen who did the work were precisely the same; and the scientific principles and laws of nature involved in each were precisely the same. Why, then, was it that for four thousand years the architect had been accustomed to beautify his work, while the engineer, with a few exceptions scarcely worth mentioning, had never attempted to do so at all? Speaking of our own engineers, as those with whom we were of course best acquainted, and speaking of engineering science in that sense which was best illustrated by the engineering works of our own country at the present day, the Professor said he thought it would strike his hearers, as it had struck him, that the engineer of every-day practice was a very busy man, and a man of large ideas, but one who had no time to devote to the proper study of a subject which was obviously so essentially secondary to the pursuit of professional success as art. Not only had the engineer to devote his attention exclusively to science,—not only had his education been based exclusively upon science,—but the principles of decoration of the simplest kind had never, as a matter of instruction, been introduced into his studies; and he might therefore be said to be not only uneducated as an appreciator of artistic design in a building, but quite uneducated in the discussion of the question whether the principles of decoration ought to be introduced at all. At the same time, it would be a great mistake to suppose that the engineer had not a sense of beauty of his own. He might never have contemplated, with any seriousness, the possibility of the great works of his profession being decorated and over-elaborated with architectural detail, but he could stand opposite to a work of engineering genius, and could appreciate and discern, and delight in, a certain degree of beauty which was visible to him, although, perhaps, totally invisible to the architect. To take the case of a suspension-bridge, it might be said that of all structures a suspension-bridge was the least capable of being made beautiful according to an architect's ideal; but yet, if an engineer were called upon to give an instance of extreme beauty, it was most likely that he would name a suspension-bridge entirely without ornament, and entirely without affectation or compromise of any kind, but displaying, to the mind of the engineer, a certain articulation, a certain anatomy of scientific construction, which the engineer had just as much right to consider beauty, and beauty of the highest order, as the architect had to apply those terms to that kind of artistic design with which he was most familiar. To carry the figure a little further, it might be said that the whole of the engineer's works were anatomical, exhibiting the strict application of science, without compromise, just as nature constructed the skeleton of the human frame, whereas the architect's work was more superficial,—not that architects were entitled or permitted to disregard the substructure or anatomy of their buildings, but, obviously enough, the principal qualities to which architects had been accustomed to direct their attention in building were superficial grace, elegance, adornment, and ornamentation. Now every one knew what the human figure was based upon, but to every one, except doctors, the skeleton of a man was about the ugliest thing that could possibly be presented to his gaze. From time immemorial it had been suggestive of all that was repulsive; but the anatomist looked upon it in quite a different light, and a skeleton would be beautiful in his eyes according to its proportions and the excellence of its configuration and pose. The anatomist was entitled to maintain that the beauty which he perceived in a skeleton was just as much real beauty as the beauty of any animal fully clothed with flesh. Again, the skeleton when only partially clothed, and exhibiting the raw muscles, was, if possible, still more repulsive to the ordinary observer than the bare skeleton, but to the anatomist there was no repulsiveness, and to those who were competent to go into the subject with him he could show wherein consisted the beauty of such anatomical "subjects." Now, architects were accustomed to deal with clothed construction, but engineers had hitherto been accustomed to deal with purely anatomical construction, and he (the Professor) fancied that this was the philosophical reason why engineering works were not beautiful. One accident arising out of the peculiar practice of architectural art had been,—not in this country alone, and not in this age only,—the introduction of various kinds of sentimentalism. To go no further than the first and grandest of all sentiments, everybody knew that religion had exercised a great influence upon architecture from the earliest times, and even in the present day a certain school of the clergy claimed to be very closely connected with architecture, and made it almost a matter of faith to adhere to one kind of architecture and to eschew the other. But apart from the religious element, there were the various archæological ideas which had been introduced, not only in the present day, but in the dilettanteism of half a century ago. Again, some architects exhibited an extreme weakness for the picturesque, and even for the grotesque. Now, if engineering works were to be made the subject of architectural design, they must be devoid of sentiment. The engineer would be, not merely horrified, but convulsed with laughter, if it were proposed to him that he should seek to make his structures more sightly by anything approaching to fancifulness or whimsicality. Those who would take up the question of the decoration of engineering structures must do so after having thrown over everything in the shape of preconceived notions of affectation or sentimentalism of any kind. Now, it was beyond question, he thought, that architectural taste in England was at present in a state of transition. Architecture, like all other art, was to a great extent a matter of fashion, and the fashion must be ever changing, for the human mind could not go on appreciating for ever the same beauties. Assuming, then, that in no great time hence there would be a change from that revived Mediæval architecture which had been practised in England of late years with great success, to that architecture which he believed could be practised with still greater success, it was desirable to inquire whether that change would not be more favourable to engineers' works being rendered more artistic by architectural forms. He thought it would be; for, seeing that engineers' works were essentially great, muscular, and grand, his audience would, he believed, agree with him that, looking at mere historical examples of various styles of architecture, grandeur and majesty were more easily attained with the simple forms of what was generally known as Classic architecture, than with the somewhat complex forms of Gothic. Again, Classic architecture was essentially an architecture of large stones,—lintels and columns,—but Gothic architecture was an architecture of small stones; indeed, in the Gothic style it was possible to construct the most huge fabric out of brick-bats. Therefore, if engineers in the future

were disposed to allow architects to adorn their (the engineers') structures, it would be all in favour of architects if they had forgotten all about Gothic architecture, and had a thorough knowledge of Classic. Now, what was the very first of first principles which the engineer would dictate to an architect whom he might call in to ornament his structures? In his (the Professor's) young days, when architectural criticism was studied, architects were taught to concentrate their attention upon a certain quality called *fitness*. He had heard no mention of it for many years, but it was a quality which the engineer would rake up from the dust of ages, and insist on its being applied, without compromise, to his work. He (the lecturer) would not go so far as to say that fitness was the reverse of affectation, but fitness must be the first consideration in the artistic decoration of scientific construction, or anything else. It was quite certain that the engineer would never allow the architect to conceal the scientific anatomy of his work. Now, he proposed, in the presence of a generation of draughtsmen far superior to those who existed in the days when he was brought up, to give, by of few rough sketches on the black board, a few suggestions as to the method in which he conceived engineering construction might be adorned by the architect. In the first place, he took an ordinary wrought-iron plate girder, and having explained the why and the wherefore of its constructional form, he showed that as the web had nothing to do but to keep the upper and lower members a certain distance apart, it might be pierced or perforated to almost any desired extent and design; the rivets might be designed so as to be alternated instead of being in parallel lines, and pateras and other ornamentation of that kind might be introduced with advantage. The box-girder, again, would lend itself to such ornamentation with even greater facility, for it was in itself a very close approximation to the familiar form of the rectangular breastsummer. The Professor next explained how he would treat "that difficult subject for architectural design, the ordinary kingpost truss." He had seen such trusses in which the members had been chamfered and turned, and adorned with mouldings, collars, and all that sort of thing, with very considerable effect; but he thought that the introduction of one or two additional members here and there would give a structure far more susceptible of being architecturally ornamented. Iron trussed roofs, however, presented much greater difficulties in the way of being dealt with architecturally, owing to the members which were in tension being, very often, mere thin rods, whilst the members in compression had necessarily to be of greater substance,—not that there was any very great difference between the strength of rolled iron to resist compression and tension, but because, when the members in compression were of any length, they had to be disproportionate in substance, in order to bear the cross strains to which they were subjected. In the case of an iron-roof truss of (say) four purlins, with the curved tie-rod, thought by the engineer to be of great beauty, the ordinary mode of procedure was to divide the tie into equal parts, and, at the same time, to get the struts as nearly as possible at right angles to the purlins. Now here was a structure which he did not think it was possible to make very ornamental; but if the engineer would sacrifice a little for the sake of effect, the same structure might be made nearly as strong (and quite as strong by a slight addition of substance), and far more pleasing to the eye, if the struts were fixed vertically instead of diagonally. The Professor next proceeded to speak of the large semicircular roof trusses, such as are to be seen over some of our London railway termini. If properly constructed, these trusses would increase in thickness towards the haunches; and where, as at St. Pancras, the truss came down to the ground line, it formed a curve of equilibration. At St. Pancras each truss was divided into so many portions, each of which was really an elongated arch-stone or voussoir, connected together at the butt ends by means of rivets. Such a structure, great as was the span, would, if properly equilibrated, not only bear its own weight, but would carry a very considerable load besides. In roof principals of this kind there were top and bottom flanges, connected together, or rather maintained a certain distance apart, by means of a web, which could be ornamented by perforation to almost any extent desired, and cast Gothic ornament might be applied to these principals (for such ornamentation would be strictly scientific), although probably that was the only case in which Gothic forms were to be recommended. The artistic decoration of engineering structures was not always regarded as satisfactory; for when Brunel sought the aid of Sir Digby Wyatt for the ornamentation of the Paddington Station, there was a great deal of adverse criticism, and for that reason the engineer did not like to go out of the beaten path unless he had some very strong inducement to do so. The architect, if called in to advise as to the artistic treatment of engineering structures, should scrupulously refrain from any attempt to introduce new forms, because the engineer would certainly refuse to adopt them, as his own forms were the outcome of, and were imperatively demanded by, mechanical science. In regard to bridges, there was a great deal that might be done by architects. Indeed, architects had been accustomed to maintain that bridges were their own special province, although it was true that tubular bridges and lattice bridges of large size were wholly in the hands of the engineer. It was incontestable that many of the best bridges in the world were the productions of architects; and it was not so very many years ago that Mr. Fowler, an architect, won the first prize, and produced the best design for a bridge, even though most of the competitors were engineers; but, as usual, the best design was not carried out. The discussion which took place on the subject of London Bridge last autumn would be fresh in the recollection of the audience, and parenthetically he would remark that the one great fault in the design of London Bridge was that the impost or springing of the arch was below the water-line at high tide; and therefore the bridge was, æsthetically considered, scarcely so creditable a work of engineering genius as it was generally considered to be. Between each of the arches was a projecting pier, utilised on the bridge level as a recess for seats. What Mr. Horace Jones and Mr. Gregory proposed to do in their joint design was to remove these seats and to throw the present footways into the roadway, and to provide space for a new footway on either side of the bridge by carrying flat iron arches (and therefore necessarily of a greater span, and springing from a higher level, than the granite arches of the bridge) from pier to pier. These iron arches appeared to be intended to be built together in short lengths, as if in imitation (whether intentional or not he could not say) of wrought stone work, the spandrels being filled in with the inevitable lattice work. Now, although it was impossible to admit that there could be any sound reason for adding ironwork to a stone bridge in the way proposed for London Bridge, it must not be assumed that the suggested *method* of widening the bridge,—irrespective of the incongruity of the materials,—was not perfectly legitimate; indeed, it was probably the only correct way to widen the bridge, and was surely not impracticable on engineering grounds. It should be remembered that by the proposed method of widening the bridge all the heavy or vehicular traffic would be thrown on the arches of the existing structure, while the footpaths and the pedestrians who used them would be the only load to be borne by the wider and flatter arches proposed to be added at either side, whether in iron or granite. Certainly as granite was the material of the bridge, the proposed additions should be in granite also; but whatever the diversity of materials, the principle of carrying the footpaths on a lighter substructure than the roadway for vehicular traffic was quite allowable, and had, indeed, been carried out in a bridge near Paris. In reference to Southwark Bridge, the lecturer described its construction, which he characterised as "perfectly sound," but he suggested that the artistic effect of the decoration attempted in the spandrels would have been far better had the prevailing lines been vertical instead of diagonal; and this mode of treatment need not have necessitated any sacrifice of the "anatomy" of the structure. In regard to bridges generally, he thought engineers often carried up the massive stone piers between the arches to too great a height. It would be far better, he thought, and more anatomically correct, to carry the parapet of the bridge in an unbroken line from end to end, and to have the face of the pier and the spandrels filled in with sculptured or other ornamentation. With regard to lattice bridges, he thought it very possible to give them a more satisfactory appearance by the insertion of ornamentation in the angles, and by certain projections on the upper and lower surfaces; and if the engineer would also, in this case, sacrifice a little of constructive utility to artistic appearance, a different manner of connecting the lattice bars might also be productive of good effect. With regard to some of the railway girders,—such, for instance, as one over the approach to the London Bridge Railway Termini,—they seemed to be the ugliest things in creation; but their surface, if not their outline, might be materially improved in appearance by judicious ornamentation. In conclusion, the Professor said that he wished his audience, as the men who would at no distant date constitute the bulk of practising architects, to turn their attention to the problem which he had sought to lay before them on this occasion, for there were two good purposes which it would serve. Firstly, the study of engineering construction would be the best study they could turn their attention to for the acquisition of science in their own profession. They would find it exceedingly simple, and should not be deterred from any fancied enormity of the subject. The fact was that the science of engineering was simple enough: it was the hugeness of the engineer's works which frightened people; but although it might be impossible for a tyro to construct a large work of engineering, it was quite possible for him to understand the principles upon which it was constructed. Ever since he (the Professor) was a student, there had been a cry for "something new," but the answer had always been that it was impossible to devise a new style except as the outcome of new constructive purposes. All the constructive purposes of the world had been long since satisfied and worked out; but as to the originality which people had been calling for so long, it must strike his hearers immediately as being palpably true that no originality was possible until there was an original purpose to be served. Here, then, was an original purpose: to take the engineer's work and beautify it with architectural forms.

A long discussion ensued, to which we will return.

## THE PALACE OF TIROOMAL NAIK, MADRAS.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

AT the ordinary general meeting of this Institute, held on Monday, the 28th ult., Sir G. G. Scott, president, in the chair, the following gentlemen were elected Fellows, viz.:—Mr. J. J. Carroll, Great Brunswick-street, Dublin; Mr. J. J. McCurdy, Leinster-street, Dublin; Mr. J. H. Owen, M.A., of H.M. Board of Works, Dublin; and Mr. Thomas Wonnacott, of Farnham.

The Secretary announced that six candidates had sent in drawings, sketches, and testimonials in competition for this year's Pugin Travelling Studentship. He further announced that the Council had elected Mr. Edwin John May as the Pugin Student for this year, and, in the same competition, had awarded a medal of merit to Mr. Garrett, on account of the excellence of his drawings, with "honourable mention" to Mr. W. Talbot Browne.

The following letter has been received by the Council with reference to the proposed Loan Exhibition of Scientific Apparatus:—

"South Kensington Museum, Feb. 10th, 1876.

Sir,—I am directed by the Lords of the Committee of Council on Education to transmit for your information the enclosed papers relating to the approaching Loan Exhibition of Scientific Apparatus at South Kensington, and to request you to have the kindness to announce the holding of the Exhibition at the next meeting of the Royal Institute of British Architects, and to ask any members who may be willing to contribute, to furnish at their early convenience a description of the objects they propose to lend, on forms similar to the enclosed, which can be obtained on application at this Office.—I am, &c.,

P. CUNLIFFE OWEN, Director S. K. M.

The President, R.I.B.A."

Mr. R. F. Chisholm, Fellow, Executive Engineer and Consulting Architect to the Government of Madras, then read a paper "On the Palace of Tiroomal Naik, Madura." He commenced by giving a brief description of Madura, the ancient capital of Southern India, and reminded his audience that Tiroomal Naik was either the last, or the last resident Naik but one, of the line of kings descending from the great Visvanuthu Naik, and to Tiroomal are ascribed most of the civil works of Madura. He commenced his reign in A.D. 1622, and the palace is said to have been finished twelve years afterwards, viz., in 1634. The accessible literature of the country is chiefly confined to the translations of certain native documents by Mr. Taylor. These documents, originally collected by Mr.

Wheatley, a confidential *employé* of Governor Lushington, do not bear the marks of remote age, and are all in the same native handwriting. The lecturer then attempted to show, by the evidences of the buildings themselves, that it was doubtful whether the description of the palace found in these MSS. was actually written by a contemporary. Passing to the actual buildings, the lecturer explained that the group now known as the palace formed only part of a very extensive range, of which few vestiges now remain. The principal quadrangle measures internally 405 ft. by 235 ft. It is surrounded by a solid wall 40 ft. high, through which there appears to have been no public opening, access being gained to the interior by smaller surrounding apartments. In the centre there is an open courtyard, originally 200 ft. by 100 ft. Between this open courtyard and the wall, the building consists of arcades on massive columns, roofed in by vaults and domes of various dimensions. The principal dome is upwards of 64 ft. across. The style of architecture is a mixture of Hindoo and Mohammedan art. In tracing the history of the building, the lecturer endeavoured to show that, as there were three periods of construction, and as nothing but a hasty surface renovation took place since the days of Tiroomal Naik, some doubt might exist as to whether Tiroomal actually commenced the structure. The lecturer admitted that the buildings told their own tale of sixteenth and seventeenth century work; but at the same time, he reminded his hearers that it was an extraordinary freak for an orthodox Hindoo rajah to have accepted the form of a Mohammedan mosque as the most suited to the requirements of his royal residence. It was improbable, though not impossible, for the Mohammedans to have commenced a mosque here, for they conquered Madura A.D. 1324, and held it for upwards of forty-eight years; and although Hindoo literature represents them as a mere bloodthirsty rabble, they accuse them of pulling down their places of worship; but people who pull down religious edifices of one creed, invariably build up religious edifices of another. Until Lord Napier and Ettrick visited the place, the buildings were simply picturesque ruins. The Government deputed Mr. Chisholm to examine them, with the view to possible restoration, and the successful attempts which were made in this direction led the Government to vote a small sum annually to uphold the structure. Finally, estimates were prepared to restore the whole, at a cost of 20,000*l*., and to make use of the buildings as public offices. The lecturer stated that the rental now paid by Government for various offices in Madura would, if capitalised, scarcely exceed the sum required for this interesting work.

In the discussion which followed,

Lord Napier and Ettrick (formerly Governor of Madras, and for a time Viceroy of India) said it would be needless for him to endeavour to convince an audience of professional architects that it was our duty and our interest in England to contribute, according to our means, to perpetuate and preserve the ancient monuments of India. It would be an unworthy thing on the part of the British Government, going to India with such large resources and with such a large amount of knowledge with reference to the arts and industries of the world, to allow the ancient monuments and buildings of India to go to decay. Our love for what was beautiful and instructive would oblige us, as a matter of duty to the whole world, to preserve these monuments of the past; but in addition to this, it was also, in a certain sense, a matter of policy for us to do so, for when we knew that our tenure of India was largely dependent upon the goodwill of the native dynasties, the very least we could do was to preserve those harmless monuments of the past with which their affections and historical predilections were identified. But with regard to buildings used for religious purposes, a difficulty had arisen which materially interfered with the efforts made by the Government of India in this direction. The Government formerly administered the very considerable revenues which accrued to some of the religious buildings of India, and these funds were devoted in a large degree to the preservation and repair of the structures. But there came an outburst of Protestant or Christian zeal in the matter, and the Government was reproached with being "the stewards of idolators," and the result had been that the Government, ever desirous to be just and generous, had given back into native hands the administration of the whole of the revenues of the temples and mosques. Consequent upon this, in Southern India certain local committees of native gentlemen had been constituted the administrators of these revenues, but, inasmuch, as they felt no interest in the preservation of their ancient monuments, the funds were generally otherwise applied. But, besides this, religious zeal amongst the natives was far more likely to find vent in the construction of new monuments than in the preservation of old ones. It was doubtful whether it would ever enter into the mind of an Oriental, and especially a native of India, that it was a pious thing to preserve the monuments of the past,—the work of other men's hands; but they would devote themselves to the construction of new monuments of the same general character, though of very inferior excellence. The "religious difficulty" referred to compelled the Government to confine its efforts in preservation and restoration to secular buildings. As far as he (the speaker) remembered, there were not above half a dozen ancient, secular, or civil structures throughout the South of India which were in a tolerable condition of preservation, and which could be used for any modern administrative purposes. Many of these monuments had been in past times, and still remained, very much neglected; the truth was that the revenues for public works had, up to the present time, been too exclusively expended upon works of public utility, such as tanks, river channels, works of irrigation, railways, &c. But it must be allowed that, even if the Government had been disposed to expend more money in the preservation and restoration of the ancient monuments of the country, the architects at the disposal of the Government were, as a rule, hardly capable either of appreciating or restoring them. The public works of India had, up to the present time, been almost exclusively in the hands of the officers of the Royal Engineers, than whom there did not exist a more devoted body of men in the world, and who were men of great resource and ingenuity in practical construction; but who had rarely had that amount of art-culture which was necessary to enable them to so fully appreciate works of architecture as to seek to restore them in the most conservative spirit. Lord Napier and Ettrick then proceeded to recount the circumstances which induced him to undertake the commencement of the restoration of the Palace of Tiroomal Naik, one of the principal inducements being his confidence in the ability of Mr. Chisholm to carry out the work with a due regard to the architectural feeling of the building. The building was not very ancient, and was far from being pure, as it exhibited traces of three styles,—Saracenic, Hindoo, and Renaissance; in this respect it could not compare with the monuments of the Mogul emperors in the north. No valuable material was used in its construction; there was no tesselation, no inlay of marbles, nothing which would give to the building anything of the splendour of the Taj Mahal at Agra. On the contrary, it was a rather rude and coarse building of brick and stone. But it possessed one or two points of pre-eminent interest. In the first place, it greatly exceeded in dimensions most of the Mussulman and mixed buildings of India; and although it was not a pure or refined building, it certainly was a very picturesque and impressive one. Secondly, it offered exceedingly interesting examples of mural decoration in colour. Having discussed the question of the probable dates of various parts of the building, as evidenced by variations in style, and expressed his concurrence with Mr. Chisholm's views on this point, Lord Napier and Ettrick concluded a long and interesting speech by raising the question as to whether the pillared hall or court-yard was ever intended to be roofed in, his own opinion being that it was intended to be left open.

Mr. W. H. White, in allusion to the very meagre attendance of members, said the Institute really owed some apology to Mr. Chisholm for the state of the room. It seemed as if the members of the Institute were endeavouring to follow the reprehensible custom of the House of Commons, which was generally very thinly attended whenever anything relating to India was "on."

The President concurred in this expression of regret, and was also sorry that Mr. Fergusson was not present, although he had been fully expected.

Mr. Thomas Morris said the Institute was not only indebted to Mr. Chisholm for bringing forward an exceedingly interesting subject, but for the able manner in which he had done so. The details of the building described in the paper presented some very curious and suggestive resemblances to the details of Romanesque, Elizabethan, and other European styles.

Mr. Arthur Cates suggested that the value of the paper would be greatly increased if Mr. Chisholm would be good enough to add, in the form of an appendix or otherwise, a few details as to the manner in which the domes were constructed. The paper was one of peculiar interest, and inasmuch as the building described was coated with stucco, again raised the question as to the legitimacy of the use of that material properly so called (in contradistinction to the vile compound used as material for "dressings" in the suburbs of London and elsewhere). Stucco seemed to have found favour in all ages of the world, and was even found in the work of the Greeks at Agrigentum in Sicily, where the large figures in the Temple of the Giants were entirely of stucco. It would appear that the method adopted in India to produce a fine surface with stucco consisted in the continued manipulation of a finely-powdered plaster, beaten up closely and worked in with plenty of "elbow-grease." This very closely resembled the Greek method of using stucco, which resulted in the attainment of a hard and compact marble-like surface. Perhaps Mr. Chisholm would also be kind enough to add to his paper a few notes as to the manner in which the stucco or *chunam* was prepared and applied. It was to be regretted that the exigencies of the public service should call for the erection of partitions in the noble columnar courtyard of the palace. Having suggested that a collection of photographs (taken some years ago under the auspices of the Government) of Indian architectural monuments should be acquired for the Institute Library, Mr. Cates concluded by proposing a vote of thanks to Mr. Chisholm for his paper, and to Lord Napier and Ettrick for his interesting address.

The President said he would take the privilege of seconding the motion, and explained, by reference to the plans exhibited on the walls, his reasons for believing that a portion of the area now left open in the centre of the palace was originally covered in, or intended to be covered in. With regard to Indian buildings generally, it would be of the greatest possible benefit, not only to architecture, but to India, if a general system of restoration upon the lines observed by Mr. Chisholm could be adopted and thoroughly carried out before the ancient buildings fell into a more ruinous condition. This was a work which ought to be initiated and followed up at the public expense. He would rather that these buildings should perish, however, than that they should be restored in the sense in which much restoration was carried out in Europe. The only way of handing down buildings to future ages was by faithful restoration and careful conservation, after the manner in which Mr. Chisholm had dealt with the Palace of Tiroomal Naik.

The vote of thanks having been carried,

Mr. Chisholm replied to various questions which were put to him by Mr. Wyatt Papworth, Mr. C. Fowler, Mr. Phené Spiers, Mr. Arthur Cates, and other gentlemen. Among other things he briefly described the construction of the domes (the largest of which springs from a square of 64 ft.). They were, he said, built of brick and mortar or cement, the bricks being 8 in. by 4 in., by 1 in. thick. These were laid one on top of another, each course very slightly overlapping (towards the interior) the course preceding it. Those domes were constructed by the native builders without any centreing whatever, and Mr. Chisholm said he had himself constructed a cupola of that kind, 30 ft. in diameter, without centreing, the rate of progress being a ring of 18 in. every four days, an interval of that length being required for the mortar to set. With regard to the *chunam*, or plaster, there was no very great secret as to its composition; the real merit of its good qualities was due chiefly to the mode in which it was applied and worked. He should have great pleasure in complying with the suggestions thrown out by Mr. Cates.

The meeting then terminated. Although the audience was very small, the interest evoked by the paper was proportionately great, and so many questions were put to Mr. Chisholm that it was not until half-past ten that the President declared the meeting at an end. Amongst the visitors was Mr. Hugh Leonard, C.E., lately Officiating Chief Engineer of Bengal, who did not, however, take any part in the discussion.

The next meeting will be held on Monday, the 13th inst., when the following papers will be read, viz.:—(1) "On some Sixteenth-

Century Chantries," by Mr. J. D. Sedding; and (2) "Biographical Notices of Deceased Foreign Members," by Mr. F. P. Cockerell, Hon. Sec. for Foreign Correspondence.

## CONSTITUTION HILL AND THE KNIGHTSBRIDGE BARRACKS.

SIR,—There are two metropolitan improvements, awaiting the decision of the Government, in which the public feel considerable interest, but as those in authority do not feel quite able to make up their minds regarding them, I hope I may be allowed to make one or two suggestions which I fancy would meet most of the difficulties which occur in carrying them into effect.

First, regarding the block at Hyde Park-corner, the solution appears to me simple and obvious. It is to continue the blind piece of roadway that exists to the eastward of the Duke of Wellington's archway, partly with a straight, partly with a curved, eastern boundary line, till it meets the angle of the Buckingham Palace gardens. It would then be necessary to continue the straight line of the roadway on Constitution-hill until it meets Grosvenor-place at right angles opposite the centre of the first division of houses, and to form a new entrance to the park with a lodge where the footway now is. The slope of the new roadway on the east side of the archway must, of course, be made identical with that now existing between the archway and the hospital, and the carriageway through the arch must be assimilated to these two.

If this were done, instead of one roadway less than 40 ft. in width, the public would have two, each 50 ft. wide, the footways, in consequence, on each side of the arch being abolished; and the traffic going north would naturally keep its own side to the westward of the arch, that going south as naturally passing downwards by the roadway on the east side, so that collision or confusion would be impossible. If there were any doubt about this, a single policeman during the busy time of the day could easily enforce the division, and, in so far as the traffic was concerned, I have no hesitation in saying that there would be no junction in London between two streets at right angles with one another so commodious and so convenient.*

Among the minor advantages of this proposal may be enumerated—First, that it takes nothing from the "recreation grounds of the people." All that is proposed is to throw what is now a useless piece of roadway inside the park railings into the public thoroughfare; neither does it interfere in any way with the Palace Gardens, which ought to be respected. A second advantage, in these economical times, is, that it would be very cheap. All that is required is to move a few cubic yards of earth, build a new lodge, and supply new gates for the park. A third advantage is, that, if determined upon, it could be commenced on the following day, and opened to the public within a month, without interrupting the traffic for an hour. But to my mind its greatest recommendation is the immense architectural improvement it would effect in the locality. The northern aspect of the gateway would not be interfered with, but, as seen from the south at present, its appearance is lopsided and undignified to the last degree; but if placed in the centre of a "Place" 200 ft. wide, and with the ground rising towards it for 400 ft. in front, it would gain in dignity and grandeur to an extent it is not easy to overrate; and if the adjuncts were managed with a little taste, the Place between the hospital and the park might easily be made one of the most ornamental at the West End of London. Besides this, combined with the screen opposite, it would be a more symmetrical arrangement than at present, and form a really dignified entrance to Hyde Park from the Belgravian regions, and the south of London generally.

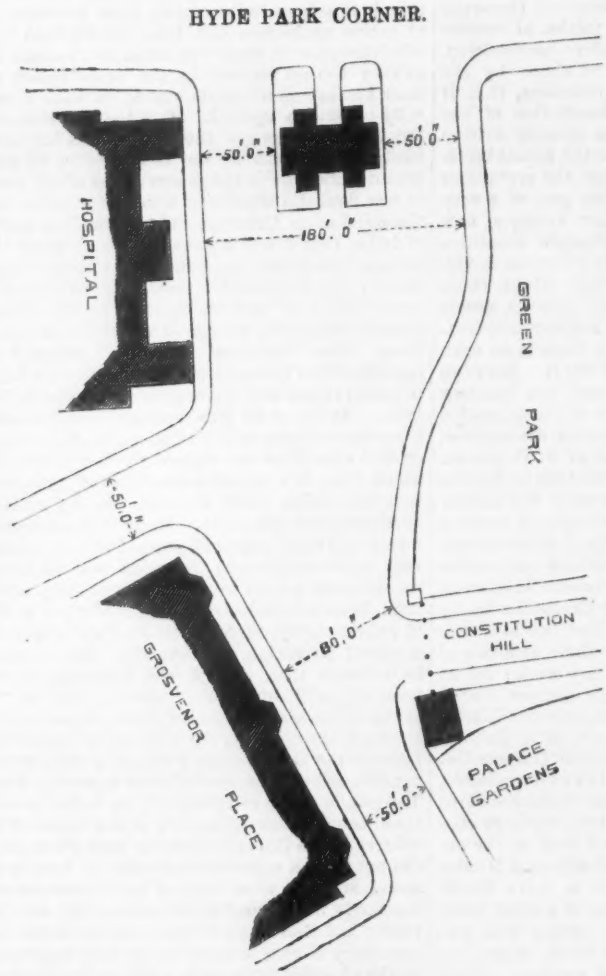
The other improvement I would suggest cannot, I fear, be carried out so economically as the last; but as the Government have determined, for military reasons, that they cannot remove the cavalry barracks from the neighbourhood of Knightsbridge, I think they may fairly be asked to incur whatever outlay may be necessary to make their presence there as little objectionable as the circumstances of the case will admit of. What I, therefore, would suggest is, that they should buy up all that second-class property between the tall houses at Albert Gate and the present barracks, and on the site so acquired erect the new buildings. After the necessary rectification and widening of the roadway, there would be room on this new site for a barrack 20 ft. wider and 40 ft. longer than the present one, besides space for a yard 300 ft. by 120 ft., in which the riding-house and loose boxes might be placed. The officers' quarters, and perhaps the hospital, might be erected on the east end of the present barrack site; and if this were done, and all the rest westward thrown into the park and roadway, it would be all the public could fairly ask for. Among the advantages of this new site is, that it is separated from the carriageway in the park by a belt of trees and shrubs, 40 ft. wide, instead of actually abutting on the roadway as it now does; and if the barrack were made a handsome building, which it might easily be, it would be a far more pleasing object from the Drive in the park than the backs of the houses in Alfred-row, and the rubbishy summer-houses that now disfigure the locality.

If this were done, in the course of a very few years the Knightsbridge-road would become by far the finest and most noble, as it is now the most important, entrance to the metropolis.

JAS. FERGUSSON.

* As already stated in the *Builder*, the Duke of Westminster has offered to contribute largely towards the cost of some such arrangement as this.—ED.

HYDE PARK CORNER.




## PROPOSED NEW CATHEDRAL FOR MANCHESTER.

OUR readers are aware that designs for a new cathedral in Manchester, by Mr. R. H. Carpenter, architect, have been before the public of that city for some time. The accompanying view of the design for the interior is taken halfway down the nave, looking through the central octagon to the choir beyond.

It shows the last scheme prepared, namely, that of an entirely new cathedral built away from the present one, which latter serves now both as a parish church and cathedral, but which, in the event of the new scheme being carried out, would remain simply a parish church. Various plans were discussed:—1. To retain the present cathedral, making it the nave of the new one; and by raising the clearstory and introducing a blank panelled triforium stage, to bring it somewhat in proportion with the proposed new choir, the octagon lantern-tower at the intersection of the nave, choir, and transepts helping to bring together the somewhat incongruous parts.

The second scheme was to do away entirely with the present structure and, retaining the site, to clear away some of the surrounding buildings, and by arching over the river Irwell and placing the church farther west, to make it the centre of a large square, to which the principal thoroughfares of Manchester and Salford should converge.

The last scheme was for building the cathedral some distance away from the present one, for which many sites were proposed; one being Infirmary-square. The dimensions of the cathedral, as last proposed, would be as follow:—

A nave of ten bays, 34 ft. wide between the arcades, with double aisles (a peculiar feature in the present church, the other English example being Chichester), making a total width of 115 ft.; the length from the western doors to the octagon being 195 ft. The central octagon is 70 ft. across, and terminates internally with a vaulted dome, 180 ft. high. The octagon tower externally is about 320 ft. high.

The choir is of seven bays, 34 ft. wide,—the same width as the nave, but with single aisles. Total width, 70 ft.; length, 136 ft.

The choir and nave are the same height, viz., 100 ft. from the floor line of the nave to the crown of the vaulting. The choir terminates square, the aisles returning round eastward, forming an ambulatory, out of which the morning-prayer chapel opens.

The total internal length of the cathedral from the west doors of the nave to the east wall of the morning-prayer chapel is about 500 ft.

The transepts opening north and south out of the octagon are each of three bays with aisles, the total width being 190 ft.

The present cathedral is dedicated to St. George and St. Denis. The ground-floor stages of the western towers in the new design are, therefore, arranged as chapels named after these saints.

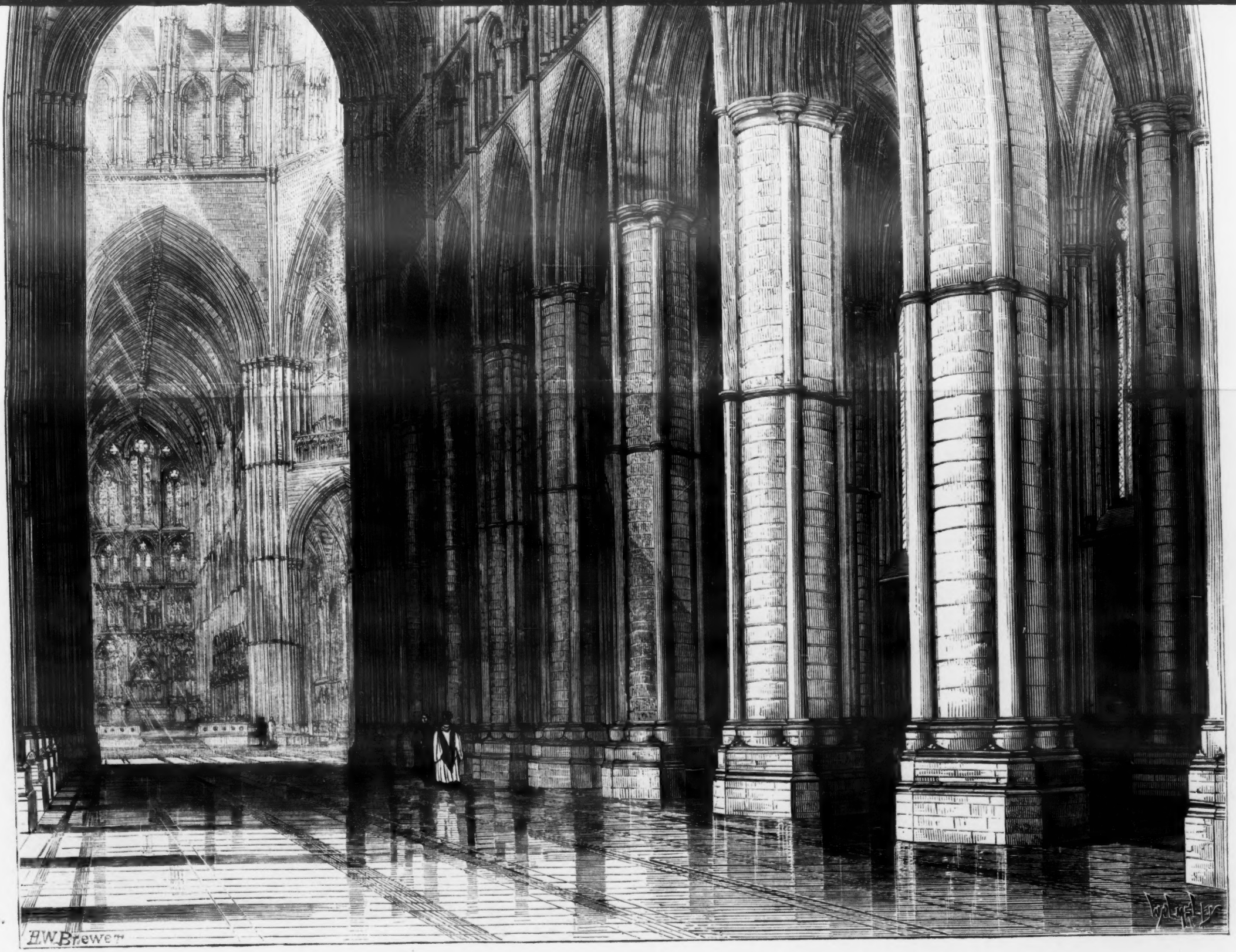
At the intersections of the nave and transepts and choir are chapels dedicated severally to SS. James and John, Jesus, St. Nicholas, and the Holy Trinity, as in the old cathedral.

The chapter-house and a vaulted muniment-room, together with choir and vergers' vestries, are on the south side.

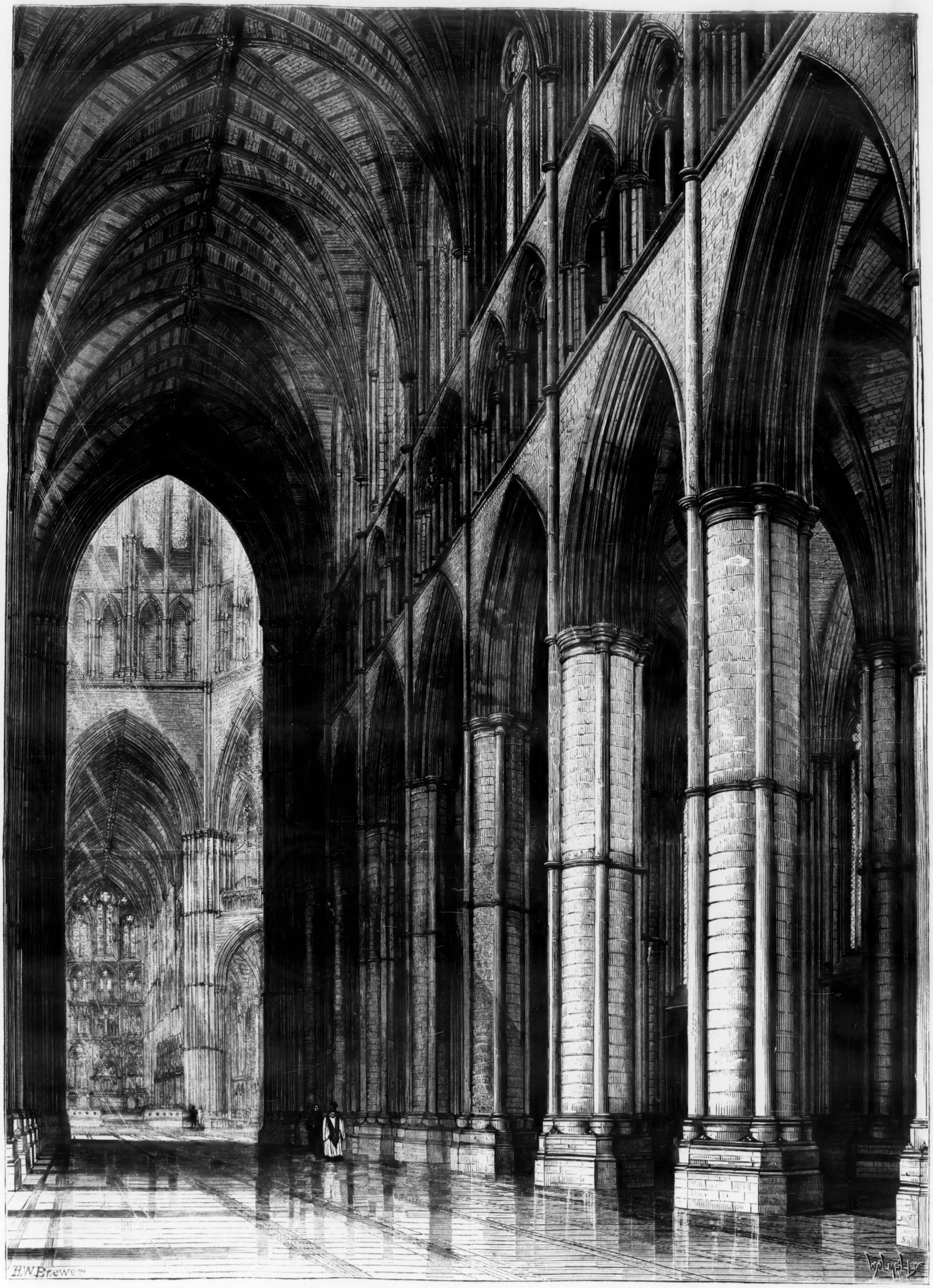
It was proposed also to build on the south side of the cathedral a cloistered quadrangle, where, in lieu of the refectory, abbot's buildings, parloir, guest-house, &c., found in old abbey and monastic communities, would be placed the diocesan buildings, synod hall, library, and offices devoted to the use of the various missionary societies, the propagation of the Gospel, &c. In addition, it was proposed to erect in connexion with these a choir school and the necessary masters' residences.

From the above description it will be seen that the proposed new building in size and proportions would rank with the first of our cathedrals.

**A Sacrifice to Theory.**—At the beginning of last year Oxford University granted an annuity of 50*l.* to Mr. Geo. A. Rowell, "in consideration as well of the valuable services which have been rendered to the University for a long period by him in connexion with the Ashmolean and University Museums, as of the attainments in Science, of which he has given evidence in several published works." Mr. Rowell has just now declined any further acceptance of the annuity, and has published a letter to show his reasons. He says he accepted it because it seemed to promise that attention would be given to his Meteorological Theory as to evaporation and electricity, and resigns it because this has been altogether lost sight of.




PROPOSED NEW CATHEDRAL FOR MANCHESTER.——View from the Nave, looking East.——Designed by Mr. R. H. Carpenter, Architect.



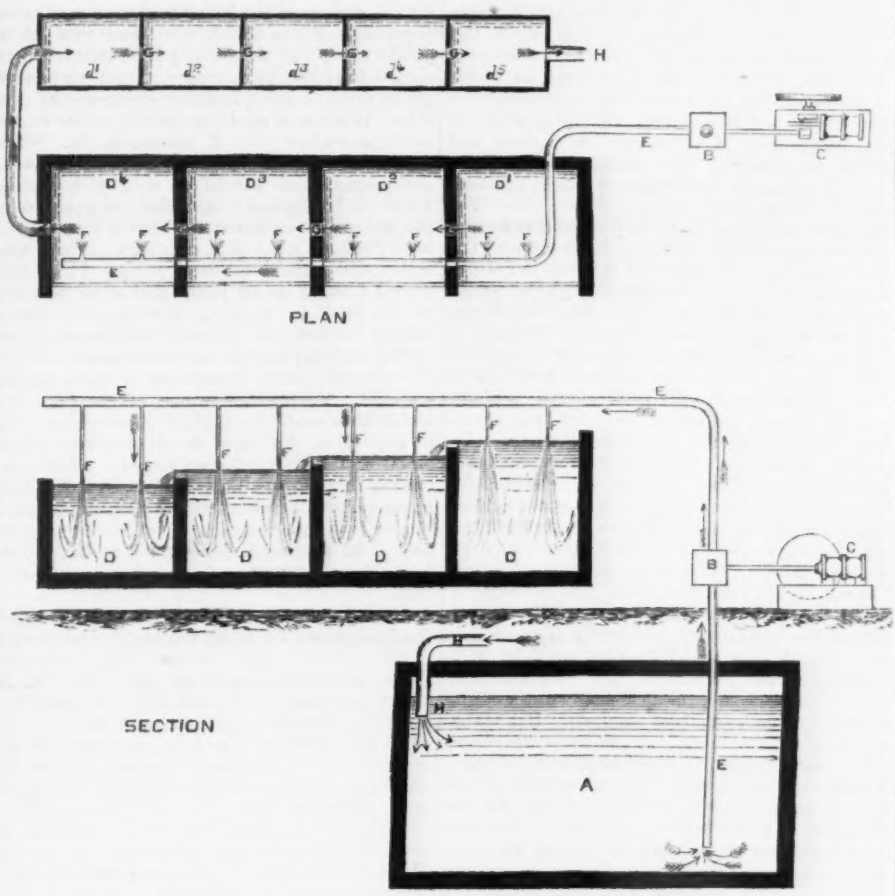
PROPOSED NEW CATHEDRAL FOR MANCHESTER.—View from the Nave, looking East.—Designed by Mr. R. H. Carpenter, Architect.

## "AQUARIA AND THEIR CONSTRUCTION."

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.*

TURNING his attention to the essential points in the construction of aquariums, viz., general arrangement, light, temperature, water supply and storage, and the materials to be used, Mr. Driver remarked that as very much of the success or non-success of an aquarium depends upon its general arrangement, too much care and pains could not be bestowed upon it. Generally it will be found advisable to keep the accommodation for spectators, and the show-tanks, in the centre of the building, avoiding as much as possible breaks in the continuity of the tanks, as all such breaks involve expense and increase the labour of maintenance, besides causing a loss of show-tank area. Probably the most economical, if not the most effective, arrangement would be a hall (say) 200 ft. or 300 ft. long, with the show-tanks on either side, with a chamber at the end for the table-tanks to contain the small specimens that have to be seen from above. Another, and perhaps a better, arrangement as regards effect consists in placing the tanks in a corridor surrounding the central hall, which can be used for concerts or as a conservatory, similar to that at the new Westminster Aquarium, avoiding, however, the excess of light in the public portion that exists there. It is only fair to say, however, that sufficiently long experience has not been obtained at Westminster on this point. The galleries shading the tanks below them are very broad and overhanging, and provision has been made not only for diminishing the light in front of the tanks by screens, but also, if needed, for isolating the tanks by glass screens in warm weather, if it be found that there is too great and too frequent condensation of water on the outsides of the glasses of the tanks as a consequence of the difference of temperature between the water inside the tanks and the water-charged atmosphere *outside* them. The arrangement of the show-tanks at the Brighton Aquarium is all that can be desired, but whether the show-tanks are in a long hall, as at the Crystal Palace; in corridors, as at Westminster; or in cathedral-like aisles, as at Brighton, the question of *light* is all-important, for to enable the contents of the show-tanks to be properly seen, it is absolutely necessary that the hall or corridor in which the spectators are should be much shaded, and that nearly all the light it receives should come through the water in the tanks. The animals being generally accustomed to deep water, into which the light penetrates but feebly, naturally seek the darkest places they can find in the tanks; and as the spectators' part nearest the tanks is, or should be, the darkest, the animals will come to the glass, thus bringing themselves close to the spectator, who will be able to see the animals without being seen himself. The absence of light near the glass prevents the growth of vegetation upon it, and obviates the necessity of much cleaning of it, and of the scratching of its surface which is a consequence of the cleaning, whatever may be the care used. The presence of light in other parts of the tanks is useful in encouraging the growth of vegetation where it is wanted, viz., on the rockwork. It may, therefore, be considered a vital necessity that there must be an absence of light in the spectators' part of an aquarium; but it must be present in the show-tanks, and this being so, it should be one of the principal things borne in mind in planning an aquarium. The darkness of the spectators' portion does not apply to the room in which the small table-tanks are placed; this apartment should, on the contrary, be moderately illuminated, as the tanks have to be looked down upon. But though light is required in the tanks, it is not desirable that the direct rays of the sun should pass through the water; on the contrary, the best possible light is that from the north; but as this is not always to be had, a wall should be built high enough, or shutters should be arranged, so as to keep the corridor behind the tanks always in shade, and which will insure not only an even amount of light, but an even temperature. As to the best angle at which to pass the light through the water, Mr. Driver said he was by no means certain. At the Crystal Palace Aquarium the angle is about 60°, and that answers perfectly. Closely connected with the question of light, and in a great measure dependent upon it, is that of *temperature*. It is highly important, with respect to the healthiness of the animals, that the water in the tanks and reservoirs should be kept at an even and comparatively low temperature, for the waters of the seas or rivers which are their natural homes rarely rise above 50° or 55°, or fall below 40°, and hence the advantage of keeping the direct rays of the sun from falling on the water or in the corridors behind the tanks. Every means should be taken, by thick walls, thorough ventilation, and shade, to keep the air cool and fresh in summer, and, by hot-water pipes, warm in winter. One reason why coolness in aquaria is so essential is because water varies in its capability of holding air in solution according to its temperature, and the higher the latter is the less it absorbs of air. The question of *water supply* has been in a great measure touched upon in the earlier portion of the paper, but there are still some things to say about it of much importance. The most important of all is the necessity of avoiding contact of water with any corrodible metal, either in the tanks or in the store reservoir. The water may pass through slate troughs, glass, stoneware, or hard india-rubber (vulcanite) pipes, but no copper or other ordinary metal pipes or fittings of any kind must be used, as the oxydation of the metal contaminates the water and makes it poisonous for the animals. It must be kept in constant motion day and night—always flowing—in fact, a regular and sufficient circulation must be kept up. In addition to the flow of water from one tank to another,* there must be a constant supply of purified water (*i.e.*, water which has remained for a time in the dark reservoir) into each and every tank, and this is done by pumping it up from the reservoir, and forcing it through pipes in a series of jets of varying size into the tanks, and the water, passing through these jets with considerable force, takes down with it into the tanks a large quantity of air which is minutely divided, and which has the purifying effect before described. The whole arrangement of the system of the circulation of the water will be better understood by reference to the accompanying ideal diagram. But to ensure this constant and steady flow, and to provide against accidents, it is necessary, as before stated, to duplicate all the machinery, boilers, &c., and a supply of piping, &c., must be kept in reserve, so as readily to repair any damage. The jets must be provided with stopcocks and spare nozzles of different sizes, so as to regulate the force of the supply, or to turn it off altogether if necessary. The sluices, also, must have gates or troughs to pass the water right across one tank to an adjoining one, as it is necessary at times to empty a tank, though the general circulation must still be kept up. The reservoir for the *storage of water* is a very important part of the aquarium indeed. It must be absolutely water-tight, as any leakage means loss of money, and not only does it mean loss of money, but it has a directly bad effect on the animals, as the lost water has to be replaced by other water, which has to go through a long process of chemical change before it arrives at a state fit for aquarium purposes, and while it is getting into that state the animals suffer. The capacity of this reservoir should be such that it contains from four to six times the whole contents of the tanks.* It is usually placed beneath the floor of the public part, or under the tanks, but its position is a mere matter of convenience. Wherever it is placed, there should be means of readily inspecting it, and in large aquaria it would be well to divide it into two or more compartments communicating with each other, but yet capable of being completely disconnected, each reservoir to be capable of containing the contents of the others in addition to its own. In small aquaria, where the expense of the attendants required to keep the machinery going by night as well as by day would prove a

*Aquarium Construction.—Arrangement of Water Supply.*




A. Reservoir (to be kept perfectly dark and cool).
B. Pumps (Forbes's Rotary are the best, as they can be made in vulcanite).
C. Engine (steam or water).
D¹ D², &c. Show-tanks.
$d^1$ $d^2$, &c. Spare or store tanks.
E E. Supply-pipe from pumps.
F F. Jet-pipes with nozzles at end of same.
G G. Sluices or gates.
H. Return-pipe into Reservoir.

*Note.*—The arrows show the direction of the flow of water.

* See p. 212, *ante*.

* Such falls as those of the Crystal Palace Aquarium are not absolutely necessary. At Westminster, every one of each series of tanks is on the same level. At the Crystal Palace, too, the tanks in the north and south rooms, which contain the smaller animals, have no difference of level.

* In hot countries the reservoir should be much larger than 4 or 5 to 1; 20 to 1 would be still better.

serious item, it would be advantageous to have, if possible, a sufficiently large reservoir at a higher level than the tanks, into which water could be pumped during the day while the engines were at work, and from which the necessary flow of water could be derived at night, thus dispensing for a time with the use of the machinery and attendance, and further giving the opportunity of repairing the engines and other machinery. The materials principally used in aquarium buildings are brick, Portland cement, stone, slate, glass, and vulcanite. For the reservoirs, good hard well-burnt bricks and Portland cement will be found to be some of the best materials. If great care is taken in getting a solid foundation, so that there may be no settlement, and if the brickwork be bedded in and surrounded with good Portland cement concrete and built in cement, and then lined inside with two or three courses of plain tiles, all well bedded and floated in cement, and then all rendered carefully over in cement, the author believes that a perfectly water-tight reservoir can be made. To avoid settlements, and consequent leakage, it will be well, where possible, to construct the reservoir quite independent of any other part of the building. At the Westminster Aquarium a plan has been tried of covering the brickwork with asphalte. This is reported to have failed, but the failure was due, possibly, to the mode of using the material. It seemed to Mr. Driver that if the bricks were made very dry and hot, and dipped into asphalte, and built in with asphalte instead of cement, and then rendered over with asphalte, a perfectly water-tight reservoir or tank could be obtained. But better still would be a brick-in-cement reservoir lined with slate, or even, if expense were not a paramount object, a series of large slate tanks joined by vulcanite pipes. But there would be the objection of a multiplicity of joints, and consequent chances of leakage, in having so many slate cisterns. The show-tanks at the Crystal Palace are built of brick in cement, but for the Vienna Aquarium Mr. Driver said he designed an arrangement of slate tanks. A great advantage in the use of slate was the economy of space,—a very important matter in a small aquarium. Having built the show-tanks, it is necessary to build in them rockwork, which, however, is not put in for purposes of ornament merely, but for use, as it is necessary that the animals should have holes for shelter and other purposes; it also encourages the growth of the necessary vegetation. The stone should be thoroughly soaked, so as to remove as far as possible the various salts that may be present in the stone; and after the tanks are all furnished with rockwork, they must be soaked out to remove the soluble salts of the cements used to fix the rockwork in place. The glass used in the tanks, and through which the specimens are seen, is the very best British plate, and requires, for the large tanks, to be not less than 1 in. thick. The edges must be all ground, so as to be perfectly flat and true, as, owing to the pressure of the water, any inequality of bedding increases the risk of leakage and breakage. The size of the squares of glass is, however, limited, and it will not be found advisable to use squares of more than 24 ft. superficial. At the Crystal Palace, squares of from 30 ft. to 36 ft. superficial area were tried, but some of them failed, and it was necessary to strengthen the others by introducing iron mullions. In addition to the risk of breakage, the element of cost is a serious item, as the difference of price between the large and small squares per foot super. is as 3 or 4 to 1. Squares 6 ft. high and 3 ft. wide will be found to answer all practical purposes. The glass must be bedded into the rebate of the stone or iron cills and mullions by a cement insoluble in water. The cement used at the Crystal Palace was from a recipe of Mr. Lloyd's, and was composed of white lead, 14 parts by weight; red lead, 2 parts, litharge of silver, 2 parts, burnt umber, 1 part. These were thoroughly incorporated, by long-continued beating, with as much boiled oil as made the mass somewhat thinner than glaziers' putty. This cement was also used to cover bolt and screw heads, or any other metal work, to prevent the contact of water. The table-tanks for the small specimens are usually constructed with sides, divisions, &c., of enamelled slate, and with plate-glass fronts; these tanks also should have rockwork in them. As it sometimes happens that collectors for aquaria will send in more specimens of a particular kind than are wanted for immediate exhibition, it is absolutely necessary to provide a proportionate number of reserve tanks for them, which will also be available for the isolation of any of the show specimens in the event of their becoming sickly, and for the storage of the living food for the animals generally. These tanks, not being exposed to public view, may be ordinary slate cisterns, connected together by ordinary glazed stoneware pipes, the iron bolts, however, being on the outside. If stone is used for the cills to the tanks, or in any other part of the work, Mr. Driver suggested that only granite, marble, or other non-porous stone should be employed, for he found at the Crystal Palace that the pressure of the water was sufficient to force it through the hard Portland-stone cills, causing a waste of sea-water, and a discoloration of stone. These cills were 1 foot. 6½ in. by 12 in., and were rendered at the back in cement. The pumps, piping, sluices, nozzles, and all other fittings connected with the supply and flow of water must be either of vulcanite, glazed stoneware, or some similar material. Vulcanite was one of the best materials that could be used, as it could be made in any form, and used in all positions where metal would be usually employed. After mentioning that Messrs. Leete, Edwards, & Norman, engineers, of Euston-road, had given great attention to aquarium machinery, and been very successful in all they had undertaken, Mr. Driver brought his interesting and practical paper to a close.

A discussion ensued, in the course of which the Chairman (Mr. R. M. Bancroft), and Messrs. Pownall, Rew, Alex. Payne, Valpy, Norman, Leete, and Guillaume, took part. Mr. W. H. Lloyd was also present, and was kind enough to answer a number of questions put to him. He exhibited photographs of a specimen of the *sagartia victuata*, formerly known as *actinia anguiconia*, a sea anemone or zoophyte. This specimen, taken at Menai, on the coast of North Wales, in June, 1855, has lived in a glass jar (containing three pints of water) in London, Paris, Hamburg, and Sydenham, since May, 1856. This now historical and still perfectly healthy and vigorous animal has, during the last twenty years, served for the performance of many experiments as to the kind and amount of food it will eat; the time taken in digesting it; the quantity of aërated water it needs under different conditions; the mode in which it repairs wounds and other accidental injuries; the manner in which its young are born; the influences upon it of various temperatures and of degrees of light, and so forth. The results thus obtained have been largely used in the arrangement of most of the public aquaria in Britain and on the Continent, and, amongst others, of the Royal Aquarium at Westminster. This famous animal has travelled with Mr. Lloyd, in company with a favourite black Angora cat, "Mim," all over Europe. Puss is still alive and well, though she is seventeen years old.

## THE LAW OF CONTRACTS.*

THE paper which I have the honour to read for you to-night was, in a cruder form, intended for a class meeting later on in the session; but, owing to a recent change in the programme, my notes had to be got into shape rather more hastily than I could wish. I have, therefore, to ask your forbearance with its inadequacy and incompleteness. It is not my intention to attempt more than a mere outline of the most important questions affecting architects which are included in the law of contracts. The subject belongs more to the region of law than to that of architecture; and in many cases legal assistance will be as necessary for the architect as medical advice would be to a man who might feel himself out of health.

To know what contingencies are to be provided for in the "general conditions" of an ordinary contract, to recognise and avoid a legal difficulty, and to gauge the different courses of action which might suggest themselves when dealing with a troublesome client or contractor, are questions that come more within the architect's province than would points of abstract law. In short, an architect is only bound to know "as much law as would enable him to keep out of it." Most persons have a notion what the words "contract" and "agreement" imply; but for sake of clearness it will be well to consider the meanings a lawyer would be likely to give these terms, and to the minor terms included in the more general definitions. A contract, then, is "an agreement between two or more persons to do, or to abstain from doing, some definite thing or things." The term "agreement" carries in law the same meaning, and is interchangeable with that of "contract."

A contract may be expressed or it may be implied. In an expressed contract the parties to it have defined their terms either verbally or in writing; but in an implied contract no stipulations were made by the parties, yet there must be something in their acts from which the law can infer an agreement. Also, a contract may be personal or non-personal. By the former is meant one the performance of which depends on peculiar technical skill and judgment; by the latter, one not involving these qualifications for its due execution. These are some of the different kinds of contracts of which the law takes cognisance, but in addition there is another and more important classification used, and this is the division into "specialty" and "simple" contracts. Specialty contracts are agreements under seal; and simple contracts are those in writing but not under seal, and also those made by word of mouth.

There are three elements in every simple contract; these are—the request, the consideration, and the promise. The request may be either implied, or it may be expressed; it is implied when the individual for whom the work is done accepts the benefit thereof, although he may not have given an order for it previously to its being done; it is expressed when the order for the work was actually made. The consideration is on the one hand the equivalent to be given for the work done, and on the other the work done in lieu of the promised equivalent. The promise is the undertaking, either implied or expressed, to pay or yield some consideration for the work done in accordance with the request. You will understand from this that the consideration is the essential element of a simple contract: a request may be implied and a promise inferred, but the consideration is a *sine quâ non*.

We next come to specialty contracts, or those under seal, and the essential difference between them and simple contracts is that they do not require a consideration to make them valid; and, as regards architects, it is well to know that a corporation can only contract under seal, and nothing but the seal will make him legally secure with the body as such, although the individuals of which it is composed may make themselves personally liable to him. It is not absolutely necessary to have the agreement in writing, but it is safer that it should be. For a similar reason legal words should be adopted, as their meanings are clearly defined.

Having made these preliminary observations on the different classes of contracts and their elements, we have next to consider the duties, rights, and authority of each of the three persons concerned in a building contract, viz., the architect, the contractor, and the employer, including such questions as the death or bankruptcy of any one of these. This task, however, in a short paper can only be accomplished in a general way, but a little more attention will be given to special points.

To begin with: the architect will be legally bound to bring to the exercise of his profession proper qualifications, and to undertake to use a reasonable amount of skill and care in the designs, and an adequate supervision in the execution of the work. If he does not, he will be liable for the consequences that can be proved to have been caused by his neglect or want of skill. In undertaking work for a client, a distinct agreement should be drawn up as early as possible in the transaction, and will be generally found to save much subsequent annoyance to the persons concerned. A contract to prepare plans on approval is very unsafe, as there is no remedy for the architect in the event of his plans being disapproved; and a contingent contract, or one in which the payment depends on a contingency, is nearly as bad, for the individual for whom the work is done may render the contingency impossible, in which case the architect will lose his remuneration, unless there is some special covenant or provision in the agreement on which he can fall back. With respect to the architect's right of payment, he will be entitled to whatever sum is mentioned in the agreement with his employer when he has performed the condition, or "condition precedent," as it is termed, entitling him to payment. Should no sum have been agreed upon, it will be inferred that a reasonable remuneration was intended; and therefore, in the event of a dispute about his charges, an architect must be ready to prove

* By Mr. H. C. Brett (hon. secretary). Read at ordinary general meeting of the Architectural Association of Ireland, on the 24th ult.

that they are only fair and reasonable. He cannot fall back upon a "Schedule of Fees," such as that of the Institute of Architects, for it is not admissible in evidence; consequently, should his charges be based on those prescribed in the schedule, their reasonableness must be proved all the same.

Analogous to the question of remuneration is that of the ownership of the plans. This point has not, I understand, been as yet finally settled by the courts. The Royal Institute of British Architects maintain that "it has hitherto been the general custom for the architect to be paid for their use only, those documents remaining his property." But Baron Bramwell, in speaking on this point, held that "the usage was impossible, and perfectly suicidal. It no sooner came into existence than it cut its own throat by its absurdity,"—a view that the *Times* and other newspapers approved of highly. If, then, the architect wishes to retain his plans, the safest course for him is to express an intention to that effect in the agreement.

The authority an architect may exercise in the superintendence of works will depend mainly upon the terms set forth in the contract; but should this document be silent on the point in question, the architect's authority would probably be limited by usages, provided such usages were reasonable.

"If the parties so agree there is practically no limit to the authority with which the architect may be invested; that he may be endowed with a discretion the extent of which would depend only on the power of his employer; that if the terms of the contract are clearly expressed, the builder may be placed almost absolutely at his mercy; but that if this be intended, in each and every case the conditions should be expressed in unmistakable language, for if anything is left to be implied by the law, that only will be implied which is reasonable.*

One of the most powerful weapons by which an architect can enforce his authority, and insure good workmanship and materials in his buildings, is the certificate; for if the contract requires that, to entitle the builder to payment, the architect must previously testify by a certificate his satisfaction with the work done, the contractor cannot recover his money without that certificate, even if the work were well done, and the party for whom it is done satisfied. There is, however, one exception to this general rule, and that is—should the architect be guilty of fraud or misconduct in withholding his certificate, as, should these delinquencies be proved, the contractor will probably have the Court's assistance. An architect is not ordinarily liable for the interferences which the erection of buildings under his charge may cause to his employer's neighbours—light, air, water, &c.—unless there is a stipulation to the contrary in his agreement. For instance, if the architect undertook that in designing a house no infringement of neighbours' rights would occur, but afterwards, in course of erection, an interference does take place through his fault, it seems only fair that he should be responsible for the error.

The general rules relative to the "quantities," where no special arrangement has been made relative thereto between the architect and his client, will depend to a great extent on the usage extant. If, then, it is the practice of the profession to employ a surveyor to take out the quantities, the architect is impliedly authorised to engage a surveyor, and the contract (if conditional) will be binding on his client until after the tender has been accepted, when the liability to the surveyor shifts on to the builder.

An architect's contract with his client is what has been above described as a personal contract, or depending on peculiar technical skill. The way this peculiarity affects him is important in the event of his becoming incapacitated for work, or should such casualties as death or bankruptcy occur; for the trustees, executors, or assignees can only recover the remuneration due for such work as the incapacitated, deceased, or bankrupt architect has executed; but they are not entitled to complete his unfinished works, unless by special agreement. In all cases, however, much will depend on the terms of the architect's contract with his client.

Passing on to the builder, we are told that his contract is not a personal one, like the architect's, unless it is made so by some special covenant in the agreement. His duty is defined in that document, his liability in case of default fixed, and the payment or consideration to which he is to be entitled set forth, as well as all the privileges he is to be granted. All these points, as well as all others which the architect considers advisable to include, should be distinctly specified, and nothing, if possible, left an open question. The clauses requiring greatest caution are those bearing on the architect's certificate and authority, mode of payment, the extras, the penalties, and what are termed the bankruptcy clauses.

The state of the case as regards the architect's authority and certificate has been already mentioned; it will, however, be necessary to say a few words on the subject of the builder's right of payment. In the absence of special provision on this point in the agreement, the following appear to be the general rules sanctioned:—If the contractor has undertaken to do certain work for a fixed sum, so long as that work remains unfinished he cannot recover payment even for the part of the work he may have done, unless the employer has refused to perform his own part of the bargain, or incapacitated himself from doing so; or, again, if he has accepted the benefit of the work done in a manner which would make it possible to infer an intention to pay for it; or if he has dispensed with the conditions of the contract; or, lastly, if the work done was not included in the contract. If the contractor has unfaithfully or carelessly performed his contract, and seeks payment therefor, the employer can seek to reduce the claim by proving defective workmanship or materials.

Probably the most delicate point in a building contract is the question of extras. They are not seldom the *casus belli* for a triangular duel between architect, builder, and employer. The principles which regulate them are not, however, very complicated. Speaking generally, if the contract provides that alterations and additions are not to be charged unless authorised in a particular manner, that provision must be followed to enable the contractor to recover for extras; also, the order therefor must have been given previously, and not subsequently to the execution of the work.

Again, in an action to recover extras ordered by the architect, it must be proved that he was either impliedly or expressly authorised by his client to give the order for the works. Should, however, the contract declare the architect arbiter of the value of the work done, and have given his certificate therefor, the question whether or not an order was given will be nugatory. Finally, it must be distinctly remembered that if the conditions of the contract with reference to "extras" are to be rigidly enforced, the architect must not travel out of that agreement; for if the contractor succeeds in proving that the additional works are not within his contract he does not require a written order to recover payment for them, nor even a verbal one, if he can establish some act on the employer's part which will enable a court of law to imply a request.

What are usually termed the "penalties" in building contracts in reality come under the legal term of "liquidated damages," otherwise they would not be recoverable in a court of law. They are to be considered as an assessment which the parties have agreed to in compensation for the damages occasioned by a breach of contract, and they will be bound by it. But should an action arise, and the court consider the assessment to be in reality a penalty, the oppressed party will be entitled to relief; and the jury will be directed to assess the employer only such damages as will fairly compensate him. It would also appear that if the failure on the part of the builder to complete his contract be due to some act of his employer, the latter will not be entitled to recover damages unless there is some special covenant in the contract which will enable him to do so. In the event of an inevitable accident happening to the works in progress, there are three cases to be considered:—1st. When the agreement is to do certain works, there being no stipulation deferring payment until their completion. In this case the builder would be entitled to payment for the work done up to the time the accident occurred, as well as for the materials used. 2nd. If the agreement was that the contractor was not to be paid until the work was complete, he would not be entitled to any remuneration on account of an accident, but should make good the damage. 3rd. If the works are to be paid for in instalments the contractor will be only entitled to such instalments as he may have earned up to the time the accident took place.

The builder's contract not being personal, in the event of his death, or his becoming a bankrupt, when there is no special clause in the contract providing for such a contingency, the executors or assignees, as the case may be, will be entitled to his rights of contract; they are bound, if they have assets, to complete his unfinished work.

As the paper has already exceeded the length originally intended, I shall say only a few words about the employer. It is needless to say that his duties will depend on the agreements with the architect and with the builder. In the event of there being no agreement between the architect and his client, it may be useful to know how the case would stand in a question like the following, which is not uncommon. Suppose the order to the architect is to design a house that will cost a certain sum, but when the tenders are opened it is found that they exceed the amount specified, would the architect be entitled to remuneration? The answer appears to be that if the lowest tender were reasonably near the stipulated cost, the architect could recover his fees. Similarly, the client would be entitled to object, were the plans for his house not prepared within a reasonable space of time. The word "reasonable," however, allows great latitude of opinion; for, to quote Baron Bramwell's simile, "We know that at noonday it is light, and at midnight it is dark; but it is difficult to say exactly when daylight ceases and night begins." When, however, there is an arrangement between the architect and his client on this point, of course each party may hold the other to his bargain.

The rules applicable in the event of the bankruptcy, death, or incapacitation of the employer are nearly identical to those above mentioned in the builder's case; therefore, the contract not being personal, I shall not trouble you with a repetition of them.

I shall now conclude by attempting to summarise the principal points to which I have called your attention.

When the contract is only implied, a court of law only seeks to enforce fair and reasonable terms between the parties. It will admit of no usage being imported of which one of the parties was in ignorance, and none whatever that is illegal or unreasonable.

When there is an agreement, either verbal or written, between the parties, the court will seek to discover and enforce the intention of that agreement; but wherever it finds itself free to act according to its judgment, it will be guided wholly by "reason and authority."

In framing contracts, therefore, it is necessary to express every point in the most distinct manner, so as to leave no room for doubt as to the real intention of the agrement.

"The law will not afford any relief on account of the absurdity, the unreasonableness, or even the impossibility, of the particular thing which is undertaken; and if a man unmistakably contracts to do that which is impossible, he must on default pay damages, provided there is no fraud in the matter, and that it is not that which is termed a 'catching bargain.'"*

* "Legal Handbook for Architects," &c. (by Jenkins and Raymond), cap. v., sec. 36.

* "Legal Handbook for Architects," cap. v., s. 35.

## STAINED GLASS WINDOWS.†

THE fragile nature of coloured glass, exposed amid troublous times, has unfortunately deprived us of any remains of the earliest examples; but the writings of ancient historians record the art as early as the fourth century. St. Chrysostome and St. Jerome mention its beautiful effect in churches of that time, and Prudentius, also speaking of windows in St. Paulo fuori de la Mura at Rome, says, "in the windows are placed glass of various colours, which shine like meadows decked in the flowers of spring." The art of colouring glass in the form of beads, cups, and other ornaments, though found to be as old as the ancient Egyptians and Phœnicians, and afterwards known in the form of mosaics in Greece, Rome, and Byzantium, has no record of its application in a transparent state to windows previously to the fourth century. Several writers of the sixth century describe the illuminated windows then placed in St. Sophia, Constantinople. Procopius says of them "that day seemed to be born under the vaults of the temple." Gregory of Tours takes note of the breakage of a coloured window by a soldier in

† Read by Mr. Alexander Ballantine, at a meeting of the Edinburgh Architectural Association, in St. George's Hall, Edinburgh.

the church of Brionde; and this prelate, in decorating St. Martin's, Tours, caused the windows to be filled with glass of various colours. The Bishop of Poictiers, in his account of Notre Dame, in Paris, as built by Childebert, admires the gorgeous effect produced by the light passing through the coloured glass, and compares it to the fine tints of the morning sun. England's first employment of the art would appear to have been in the seventh century, when St. Wilfrid, at York, lamenting that coloured windows could not be procured in this country, sent to France for skilled workmen. By the eighth century stained glass became general; and in 863 France was so engaged in this art as to have several masters of eminence.

Having thus referred to these early records of our subject, which give a fair idea of the gradual importance it attained in these early times, but unfortunately supply no particulars of the designs, we pass on to 1052, when a historian of Dijon, describing a small window in his monastery as representing the mystery of the Holy Eucharist, seems to give the first distinct mention of the employment of the art as a means of figure illustration, and this he says had previously been in a church of earlier date.

The earliest application of coloured glass is supposed to have been pieces set in the piercings of the marble slabs or fret which were used in windows in the East at a very remote time. The effect would be brilliant, like jewels, and quite sufficient to impart all the eloquence to those early writers. If their windows were composed entirely of coloured glass, the first attempts may have been rude in design, aiming only at a glowing combination of colour; but the probability is that so soon as the art was capable of this the taste manifested in the missals of the period, and in the figure mosaics,—for instance, at Ravenna,—as early as the sixth century, would also seek expression in stained glass.

An ancient window at Neuvilles (Bas Rhin), dating from the eleventh century, partakes strongly of the character of these Greco-Byzantine mosaics. In the twelfth century, the Abbot of St. Denis invited from all countries those most skilled in the decorative arts. Chartres, Mans, Sens, Bourges, Ecouen, and Chantilly were enriched with gorgeous windows; and, with all the sad havoc of 700 years, there still remain portions exhibiting the state of the art at that time.

In describing the stained glass of the twelfth century, we may, for all practical purposes, include the greater portion of the thirteenth, and together term this the first period. The designs are in the form of small medallions inclosed in iron frames, upon a groundwork composed of patterns of diagonal, circle, square, or scale arrangement, the window surrounded by rich bordering, and the whole wrought together in small pieces of glass united by lead fret. Deep blue and ruby colours alternate as grounds throughout the design. Light colours are applied to the figures and details, such as greenish white, pale yellow, lilac, green, and occasionally light blue. The glass is thick and uneven in its surface and shade, so that the rays of light are transmitted with a much more brilliant or jewelled appearance than through ordinary smooth glass. In style of drawing these windows in a great many respects follow closely the figures and ornaments of the illuminated missals, and there is assuredly not a more reliable guide for the period of ancient glass than reference to these contemporary works. The broad, black, hatching lines of the drapery folds are identical. The scrolls, composed of conventional foliage, winged reptiles, and interlaced bands, are not only similar in design, but seem almost as mosaic in character as the glass, and are surrounded by stout black outlines, as if the illuminators had copied the appearance of the lead fret, or as if those in the habit of preparing designs for the windows had applied their rich powerful combinations of colour and strong outline while engaged upon the embellishing of these ancient manuscripts.

Probably the most ancient glass preserved in England is in the choir of Canterbury Cathedral, dating about the end of the twelfth century. The architect of that time was from Sens, and from this glass being similar to the contemporary French windows, and no evidence of the art having then attained such proficiency in England, we have no doubt these beautiful windows were imported from France. As we proceed we will see how foreign artists continued to be employed upon numerous windows throughout England.

In addition to the medallion window, a large bolder style was adopted in clearstory or other windows distant from ordinary view. These contained in each light a single tall figure of a saint executed in a very archaic manner. Some of these figures are masterly in simple severe line, but in a great many cases the harshness of the style imparts a more ogry than saintly sensation. The heads are not entirely composed of a piece of light or skin-coloured glass, with the features delineated thereon as in other work, but are formed of several pieces. The eyes are bluish glass, each surrounded by the lead, which is united together at the corners across the nose,—spectacle fashion,—then shades of purple, blue, or green set in the same manner from the moustache, beard, and hair. By the right placing of these leads across the features a good expression at a distance is attempted to be produced; but one might as well try to produce portraiture by some system of tatoo. The figures are drawn in a very attenuated manner, to suit the tall narrow spaces, and the drapery hangs in a few straight lines, formed either by the lead fret, or equally broad black lines fused upon the glass. Shading, to impart any appearance of relief, is entirely avoided, and the combination is much after the manner of a diagram in flat vivid surfaces of colour. The style seems to have been more employed upon the Continent than in England, though in the modern copyism of Mediæval glass we have numerous reproductions. The thirteenth century produced also many fine Jesse windows, thus termed from the design enclosing within interlacing branches and foliage all the generations from Jesse, who usually reclines at the roots or base, to the Madonna or our Lord in majesty at the top of the window or tracery. The great west window of Durham Cathedral, recently skilfully restored, is a good specimen. There is also a famous one of later date in Nuremberg, designed by Volkamer.

The introduction of light ornamental grisaille windows belongs to this time, and, as a decorative treatment, was well calculated to produce a more airy and spacious feeling in the interior of these Early Pointed structures. From the general absence of figures, some have supposed that the reformed notions of the Cistercians devised this style.

The effect of the grisaille, or grey, is produced by light cool pieces of glass, ornamented with an outlined leaf or pattern, and hatched over the ground by thin black lines, that blend together at a short distance, like a semi-tint. Colour is interspersed sparingly in bosses or geometric bands, as at Salisbury and York. The north transept window of York Minster,—known as "The Five Sisters," shedding their gentle light upon the clustered shafting and richly-moulded arches,—forms a perfect poem of architecture. The legend tells of the design having been in needlework, and sent to foreign countries to be produced in stained glass. This may be, though from the quantities throughout England during this and the following century, when the wars with France were raging, it is evident that this light style of glass was manufactured in this country. The tints are irregular, and seem just such as would be produced by the impurities of the ingredients before the application of manganese was known as a clarifying or purifying agent. The thickness and coarseness was obviously of great service for a rich crystalline effect.

The quarry or lozenge-paned window, diapered in a similar manner, and set at intervals with ornamental bosses or panels, formed a simpler description of window during the latter part of the thirteenth century. The declaration of war with France in 1293 by Edward I., and which lasted with scarcely any intermission for a century, would sever our opportunities of further importations of the richer specimens of art. Whether, by the alliance then formed betwixt France and Scotland, any of the Scottish ecclesiastical edifices received foreign specimens of glass, we are unable to ascertain. There is, however, evidence that many of these contained coloured windows, from the fragments that have from time to time been discovered in a decayed state amongst the earth adjoining Dunblane, Cambuskenneth, &c.

Stained windows of the fourteenth century or Decorated period contain, like the detail of the architecture, a more natural character of foliage, and the figures have no longer a sameness of feature, but are taken more directly from life. Canopy and shrine work forms a prominent part of the design. In tall lights, figures and their canopies are ranged one over another in several tiers, or a panel group to a smaller scale forms a base to the saint and canopy above; or a simple design has only a portion of each light occupied by a figure and small canopy, while the remaining space above and below is filled with light ornamentation not usually cross-hatched in grisaille, but simply outlined. Yellow stain, produced by the fusion of oxidised silver upon light glass, first occurs at this period, and by its application a warmer amber colouring is obtained. A deeper golden shade is also substituted in the pot-metal glass for the pale yellow of earlier work, and secondary combinations of colour, such as purples, greens, &c., attain greater richness. The stirring incidents of our history provide abundant illustrations, and knights accoutred in all the trappings of the field are enshrined in the chapel windows for their heroism in the Holy War, thus forming most precious relics of armour, heraldry, and costume. As the drawing improves, there is a more studied use of shading in the heads and draperies, without losing brilliancy, but rather gaining by the lights, thereby shining more prominently. Faces are wrought with remarkable vigour upon skin-coloured glass, and the shade colour is frequently left upon the hair, so as to distinguish it firmly from the flesh. With the Perpendicular style of architecture, commencing towards the close of the fourteenth century, light silvery glass pervades the windows. A greater delicacy of execution is found in the tracing lines and shading. The glass is also thinner and smoother, while richness is imparted by diapering and staining light yellow. Canopy or tabernacle work is executed in white, to which the gold-colour stain is freely applied. Profuse elaboration of crockets, pinnacles, and tracery form the design, and the backgrounds, with occasional intervening parts, are ruby or blue. The leaves are not nearly so naturally delineated, nor are the heads generally so noble. The draperies of the larger figures have in many cases a grain or stipple shadow, whereby a pleasing transmission of light is preserved. As the style advanced, this became rougher and more open in the grain, and was ably practised in the Dureresque windows upon the north side of the nave in Cologne Cathedral.

A grey hue and paleness pervade all the blue then used, and the ruby also loses in strength. The fine sapphire shade of earlier glass was entirely lost, and with all the chaste delicacy of the colouring in Perpendicular glass, and the glowing combinations of Cinque-cento, the blue partakes either of a cold greyness or an obtrusive purply hue.

The manufacture of coloured glass had, in the fifteenth century, in Germany, been brought to a high state of perfection, and their blue in Nuremberg windows possesses all the quality of earlier colouring, while the blue in Cologne windows, date 1509, is inferior.

In England, during the fifteenth century, the Continental coloured glass was held in high repute. In a contract of "John Prudde, of Westminster, glazier," 1447, he "covenanteth to Earl of Beauchamp to glaze all the windows in the new chappell in Warwick with glasse beyond the seas, and with no glasse of England." A few years later was issued a prohibition of any importation of "painted windows."

The famous windows of Fairford Church, Gloucestershire, twenty-eight in number, are quite in the old German manner of the end of the fifteenth century, which in its freely composed draperies and bold conventional folds, and decisive character of heads, is remarkably effective. A fine set of fac-simile drawings of these windows has been published by the Arundel Society as important examples of the art.

These several periods of stained glass that we have traced are identified with the different developments of Gothic architecture, and partake intimately of their features and spirit; but an entire change of style, as in architecture, takes place in the sixteenth century, or cinque-cento period. The old, with all its associations obnoxious to the new spirit and fashion of the Reformation, subsides, and new forces of art spread over Europe. Painting, sculpture, architecture, music, and poetry all excelling at this time in Italy, there also we find gorgeous and masterly application of stained glass. The Venetians conferred high honours upon numerous eminent "gentlemen glaziers," as they were then quaintly termed. It is, however, to be lamented that few examples of these works have survived the incessant invasions and civil wars throughout that gifted land. Windows of the Duomo smashed so that the lead thereof

would provide bullets for the besieged, tells too frequently their desperate fate. Santa Maria in Florence, Perugia, Sienna, and Milan cathedrals show how to combine magnificent breadth of light with richness of colour. Flemish Cinquecento glass fills the choir windows of Lichfield, and the Dutch artists were skilful in this art. The Swiss produced also some choice combinations with enamel tints. In the reign of Henry VIII. those twenty large windows of King's College, Cambridge, were erected. The great east window has not unworthily been ascribed to Holbein.

In substance and colour the glass was similar to that of the preceding century, but the processes of execution were somewhat changed by the introduction of enamel tints as auxiliaries, and by the removal of ruby from the flashed side of the glass by means of fluoric acid. By so much roundness attempted in the shading, and by the concealment of the lead-lines amongst the shadows, the work is discovered to have been directed by a painter, who has not discriminated between the principles applicable to a window as differing from a picture. This, fortunately, is not always the case, for there are many instances where a clear silvery effect of light, gemmed with brilliant disposal of colour, is the result. So varied, however, are the productions, compared to the more conventional arrangement of the Gothic styles, that it is impossible within present limits to state more than general points of resemblance. Ornamental adjuncts to their large illustrations were either of the most florid Late Gothic or Renaissance, which committed great incongruities by spreading huge baldachino designs, executed in coloured glass, over several narrow lights, heedless alike of relative proportion or style. When the grouping of figures forming one illustration throughout two, three, or more lights, has regard to the due architectural importance of the mullions, a grander and more impressive whole is obtained, with the advantage of larger figures; but the temptation to a designer of glass is so great that there is in this treatment great danger of the architectural design of the mullions and tracery being disregarded. This proved to be the case by the close of the sixteenth century, and with the free use of enamels a resemblance to painting became general, and stained glass, instead of a medium of light and beautiful crystalline colour, became feeble and opaque. Heraldry alone retained in its decided tinctures and medals somewhat of the old brilliancy, and by means of flashed colours and yellow stain great nicety of execution was practised.

During the seventeenth and eighteenth centuries a very meagre account can be given of the art, as the prevailing Puritanical tastes discouraged all such ecclesiastical embellishments. As a decoration to the mansions, however, it was freely applied. Oxford is said to have the best examples of church glass of this time in the windows by the brothers Van Linge, which are treated in the usual Dutch style of square leaded panes, with a group upon large surfaces of enamelled landscape. Reynolds's window, in the College Chapel, notwithstanding the graceful conception and expression of the figures, is merely a warm sepia picture disfigured by rectangular lead joinings of the panes of glass. Until the revival of the study of Mediæval architecture no attempt was made to resume the principles and processes of ancient glass. A considerable time was required to overcome the harsh vivid colours and smooth uniform surface which modern manufacturers of coloured glass thought immense improvements upon the old. Modern combinations of such glass was accordingly unsatisfactory to those familiar with the effects of the ancient, and though the surface was bespattered with dirt, and many other deceptions were adopted to anticipate the action of time, all was unavailing for catching the real quality of colour, until, by Mr. Winston and Messrs. Powell's analysis of old glass, they produced in 1849, their beautiful antique pot-metals. Messrs. Hartley, of Sunderland, soon followed, and afterwards Messrs. Chance, of Birmingham (both eminent glass manufacturers), in producing similar glass, and thereby the great difficulty that the revived art had in obtaining substance, texture, and the mellow brillancy of ancient windows was overcome. Varied as this is now produced, from pale to deep, according as each piece varies in thickness, the flat uniformity of colour is broken up, and this is carried further by doubling one colour, in a molten layer, over another, thus having ruby blending to blue, or ruby to orange, or blue to green, almost rainbow-like in their glowing gradations. Draperies, foliage, &c., gradating in this manner undulate richly in their colours. The more diversity that can thus be produced, and skilfully applied, in the working together of the many pieces composing a window, the more hopeful are grand rich effects for the future of the art. Browns like autumn tints, whites iridescent as the pearl, greens and colour varying as in leaves and flowers are no over-sanguine hopes; and if this art can also woo master-minds to reveal in her the treasures of Scripture, depict the loveliness of nature, record the scenes and history of human life, and indulge in "divers fancyes," the storied panes of the future may be even more richly dight than those of old.

## LEGISLATION ON THE CONSTRUCTION OF HOUSES.

THE Council of the Social Science Association had under consideration on Thursday last (9th) the following

Report from the Standing Committee of the Health Department, on the subject of necessity for further and more complete legislation on the construction of dwelling-houses:—

"(*a.*) That the earnest attention of the Local Government Board be directed to the necessity for amending and consolidating the law with regard to building construction into one Act applicable to the whole country.

(*b.*) That the present state of the law, permitting as it does of the erection of houses totally devoid of all necessary sanitary considerations, is calculated to defeat the object and to render nugatory the otherwise beneficial operation and action of recent sanitary legislation.

(*c.*) That the administration of any Act of Parliament relating to the proper hygienic construction of houses should be entrusted to proper and efficient officers, under the direction of the local authorities, with controlling power of a central authority (say the Board of Works for the Metropolis).

(*d.*) That inasmuch as the defective sanitary construction of houses in all large cities materially contributes towards creating a high rate of mortality, no legislative measure can be considered effective which does not determine a standard of habitability, and which does not contain a clause enacting that all newly-built houses and their appurtenances shall be certified as fit for habitation by the officers of the local authority before it shall be lawful for the same to be occupied."

## A NEW LOOKING-GLASS.

M. LENOIR, the well-known inventor of the gas engine, has brought out a method calculated to facilitate the safe manufacture of looking-glasses. His new system was subjected to the Société d'Encouragement, and this important body has, after due investigation, published a favourable report. It is notorious that innumerable efforts have been made to replace the dangerous use of mercury by some more innocuous substance. The silver foliating process, conceived by M. Drayton, and perfected by M. Petitjean, is the only system which as yet affords any practical solution to the difficulty. We may mention that it consists of placing a thin layer of silver, which is obtained by previously reducing with tartaric acid an ammoniacal dissolution of nitrate of silver. Unfortunately, the mirrors thus produced are marked by a disagreeable yellowish tint, which does not exist in the glasses prepared according to the old and dangerous system. Further, it has been remarked that the adherence of the silver on the glass is not very reliable; and it has also a tendency to blacken under the influence of sulphurous emanations, notwithstanding the varnish laid on to protect the back of the mirror. This deterioration is particularly noticeable when mirrors are exported beyond the equator, and confined for several months in the hold of a ship.

By means, however, of the improvements which M. Lenoir has suggested, these inconveniences are entirely obviated. His process consists of the amalgamation of a very small quantity of mercury with the layer of silver previously affixed to the glass. This is easily obtained by dropping a solution of cyanide of mercury over the silver. This salt reacts on the silver, dissolves it in part, leaving a small quantity of mercury free to combine with the silver remaining on the glass. Thus prepared, the mirror loses its objectionable yellow tint, and the silver is less susceptible to sulphurous emanations. Finally, the adherence of the metal on the glass is better secured. M. Lenoir's success is not merely theoretical; his mirrors have been submitted to an experimental test lasting two years. During this time they were exposed to the trial of long sea journeys, and the metal preserved its colour and position against the glass. This new invention will be all the more welcome when we remember that the mercury usually employed endangers the very lives of the workmen who manipulate this treacherous substance; and sometimes also, when yielding to certain atmospherical influences, gravely compromises the health of persons living in rooms profusely ornamented with mirrors.

## MODERN MOSAICS.

AN interesting report on Briffaut's mosaic floors has been drawn up by the Industrial Society of Northern France. These are not made of pebbles or shells, but of thin pieces of oak and other woods placed together so as to form designs. These pieces are not, however, held by frames or by glue, but are maintained in their proper position by a layer of bituminous mastic poured while warm over the wood, and then covered by a large terra-cotta or hardware tile. Thus the three substances are knit together, and, to render their adherence still more secure, conical iron bolts are driven into holes previously pierced through the terra-cotta to the wood. This also is done while the mastic is still pliable. The mosaic fixed in this manner on a tile is about 20 centimètres square, and can be placed on a layer of sand and a bed of mortar or cement, to constitute a floor. The tiles supporting the mosaic are connected by thin iron spikes, which readily fit into grooves previously prepared. This system of flooring can, therefore, be used wherever terra-cotta, hardware, or porcelain tiles are now employed. It is easily removed from place to place, and the inventor further intends so modifying his system as to render it applicable to cabinet-work. M. Briffaut, we should add, does not consider that the cost of this style of ornamentation is likely to be any impediment to its success.

## THE IMPROVEMENT OF FRENCH PORTS.

DURING the last few weeks we have been pleased to note the publication of decrees in the *Official Journal*, sanctioning extensive works for the improvement of various French ports. The Minister for Public Works is, for instance, instructed to accept, in the name of the State, a loan of 600,000*l.*, offered by the Calais Chamber of Commerce, to forward works in the harbour of that town. M. Teisserene de Bart, who will probably succeed M. de Meaux in the Ministry of Public Works, submitted to the Budget Committee a project for raising a loan of 505,000*l.*, which will be accepted by the State for the purpose of continuing the works and improvements of Dunkerque Harbour. The port of Rouen, also, is to be enlarged, and a loan of 120,000*l.* will facilitate this work. This inland town will thus be rendered more accessible to sea-going ships. This is a step towards satisfying the ambition of those patriots who long to see the capital of France become a maritime port, though Paris is so much farther up the Seine than Rouen.

In Algeria, the Chamber of Commerce of Philippeville has received official notification that it may issue a loan at six per cent. for the completion of its port. The loan is to be refunded by means of a tax levied on all ships availing themselves of the new harbour.

## THE DUBLIN SCHOOLS OF ART.

THE prizes awarded to the successful students of the Royal Dublin Society's Schools of Art for the year 1875, were distributed on Monday, the 28th ult., by his Grace the Lord Lieutenant of Ireland. More than ordinary interest was manifested on the occasion in consequence of the Government scheme *re* science and art, which, if carried out, will place these schools on a wider basis, and effect changes in the constitution of the Royal Dublin Society and the Royal Irish Academy. The report of the head master and general director (Mr. R. Edwin Lyne) was submitted to the meeting, showing that considerable progress in art instruction has been made in the Dublin schools. From the report we learn that the total number of national awards made to the whole of the schools of the United Kingdom since their institution in

1866 to the present time has been 1,546. The Dublin School has obtained one-nineteenth of the entire number of such awards, though competed for by an average of 115 schools of art; one-seventeenth exclusive of those gained at South Kensington, and one-thirteenth exclusive of those taken by South Kensington and other London Schools of Art. Despite of difficulties, the Dublin schools have, it appears, obtained a success that has been denied to institutions enjoying Government aid. Since 1866 the principal studies have been transmitted to London to compete for prizes of the highest grade, and for national awards, with the chief productions of the whole of the art schools. In the late London International Exhibition of 1874, the Dublin Society's schools submitted eighty-four works illustrative of the higher stages of original art study, including specimens of manufacture executed from the designs of the schools. The whole of these works, and the students by whom they were executed, obtained, during the past year, medals. An exhibition of the works of drawing, painting, and modelling of last year took place during the Christmas vacation, and was visited by 8,000 persons. The number of works selected to enter the national competition amounted to fifty-two, and five awards were obtained. The examiners of these works refer in their report to the satisfactory studies in the higher stages of art instruction, making particular mention of the studies executed from the living model, the figure from the antique, and the still-life studies in oil.

## THE COST OF BUILDING ST. THOMAS'S HOSPITAL, AND ASSESSMENT.

THE outlay incurred in building St. Thomas's Hospital was disclosed in the course of an inquiry before the magistrates at the general assessment sessions last week. The overseers of Lambeth appealed against a decision of the assessment committee of the Lambeth vestry, under which the gross value was set down at 8,400*l.*, and the rateable value at 7,000*l.*, although in 1872 the magistrates fixed the gross value at 13,080*l.*, and the rateable value at 10,900*l.* The overseers now applied to the court to restore the gross and rateable value to that amount.

Amongst the witnesses examined on behalf of the appellants was Mr. Vigers, surveyor, who gave evidence as to the cost of the building, including the land. He stated that the ground upon which the hospital was erected was 8½ acres in extent, and the price paid for it was 90,000*l.* The sum of 48,000*l.* was expended upon the foundations, bringing up the outlay on land and foundations to 138,000*l.* The structure cost, excluding all ornamentation, 294,000*l.* Altogether, the total cost was 432,000*l.*, and he thought that, at 3½ per cent., would give 15,120*l.* as the value, the landlord doing the repairs. From that amount he deducted 10 per cent., and that made the rateable value 13,680*l.* Looking at the cost of land in other parts of the metropolis and buildings generally, he should say 10 per cent. was the deduction. He took in his valuation a plain building at the cost of 8*d.* per foot; but residences would, at the present time, cost 1*s.* per foot.

Mr. Trollope, surveyor and builder, corroborated Mr. Vigers's statement, and added that such a structure could not now be erected for 350,000*l.*

Mr. Henry Currey, the architect of the building, was also called as a witness during the inquiry, and in the course of his evidence he said that one reason why the hospital was so expensive was, that part of the foundation was on land which formerly formed a portion of the bed of the river, and they had to place concrete and form a basement under the whole building.

Other witnesses were called on the part of the governors of the hospital to prove that the gross value was 6,000*l.*, and the rateable value 5,000*l.*, and Sir Francis Hicks, the treasurer, stated that the high rating had rendered it necessary to close 141 beds. In order to show that Lambeth saved a large amount in parochial expenditure through the hospital, he stated that they had as many as 50,000 out-patients, more than one half of whom came from Lambeth. He added that the figures of the indoor patients did not include maternity cases, which amounted to 1,100 or 1,200 from Lambeth, for which that parish would have had to pay 10*s.* each case to their medical officers, if the women had not been relieved at the hospital. In answer to a question, he stated that the income of the hospital was 40,000*l.*, from which had to be deducted 7,000*l.* interest on borrowed money.

The Court ultimately decided that the valuation should be restored to the original amount fixed by the Court in 1872, viz., 13,080*l.* gross, and 10,900*l.* rateable value.

## THE TRADE AND ANNUAL VALUE OF THE SURREY COMMERCIAL DOCK COMPANY.

THE amount of business annually carried on at the Surrey Commercial Docks, which is chiefly confined to the timber trade, was disclosed at an investigation at the General Assessment Sessions, Westminster, when the Company appealed against the sum at which they had been rated by the Rotherhithe local authorities. The dock premises had been assessed on a gross value of 64,461*l.*, with a rateable value of 48,346*l.*, and it was this valuation that was appealed against. It was stated on behalf of the company that the old assessment was 42,850*l.*, and in November, 1867, it was raised to 42,869*l.*, which in 1870 was again reduced to 37,061*l.* Since that time new buildings had been erected and other alterations made to the premises, and the rateable value was increased in the supplemental valuation list to 38,525*l.* Since that valuation there had been no substantial change in the character of any of the property. The docks were chiefly used for the importation of timber, and the trade in connexion with it. The years 1873 and 1874 were exceptional years as far as the wood trade was concerned. In 1873 the importation was 754,000 tons, and in 1874 it increased to 878,000 tons, dropping in 1875 to 744,000 tons. That showed that there was an inflated state of trade in 1873 and 1874, which suddenly dropped in 1875, and therefore it was not fair to base the assessment upon these exceptional years. The respondents seemed to have based the assessment on the average of the gross receipts of 1874, which was inequitable. It should be based on the preceding five years, or, at least, three years. The average annual gross receipts for five years amounted to 210,765*l.*; for three years, 222,152*l.*; and for 1874, 252,585*l.* The dues received in 1870 amounted to 71,500*l.*; in 1871, 75,000*l.*; in 1872, 76,800*l.*; in 1873, 89,000*l.*; and in 1874, 91,000*l.* During these last two years there was an increase in the price of coal, and that led to an enormous importation of wood, but that was altogether exceptional. It was contended that the basis should be five years; but if three years were taken, 1872, 1873, and 1874, it would give the two exceptional years, and one bad year. On behalf of the respondents it was urged that the docks were a progressive concern, and that it would be unjust to take the average of the last five years, as they would be taking years worse than any future year was likely to be. The Court decided to take the average of the three years 1872, 1873, and 1874; and it was agreed, after a consultation between the parties, to reduce the gross value from 64,461*l.* to 50,000*l.*, and the rateable value from 48,346*l.* to 40,000*l.*

## THE FLOODS.

### THE INSTITUTION OF CIVIL ENGINEERS.

ON the 29th of February a paper was read "On the Floods in England and Wales during 1875, and on Water Economy," by Mr. G. J. Symons, secretary to the Meteorological Society.

The first flood, on the 15th of July, was the result of a rainfall of large amount and duration. The rain lasted on an average about thirty hours, but in most localities 90 or more per cent. of the amount fell in twenty-four hours, and at some stations all fell in twenty-four hours. This flood was chiefly confined to the West of England, and its effects were most serious in Monmouthshire and South Wales, where at many stations the rainfall on the 15th of July was nearly twice as great as the amount previously recorded at those places. Generally heavy summer rains occur in thunder-storms, but the July rain in Monmouthshire and South Wales was not of this type, and was quite as remarkable for its steady persistent rate, of about 1 in. in each of five successive periods of five hours, as for the total quantity. The damage caused by this flood was considerable. The Avon and Frome overflowed their banks; at Cinderford, Gloucester, a reservoir burst and flooded two or more mines; at Monmouth a reservoir burst and numerous bridges were swept away; and the traffic on the greater number of the Monmouthshire and Glamorganshire railways was interrupted.

From the 16th to the 18th of July heavy rain fell in various parts of the east of England and the midland counties, but with no very exceptional amounts, the largest reported being near Louth, 1·36 in., and at Halifax, 1·18 in.

Some idea of the exceptional nature of the floods of 1875 might be gathered from the observations made on the height of the Avon, at Stratford-on-Avon. Since 1800 there had been only ten floods exceeding the height of 4 ft. above the weir, and four of these were in 1875, in which year alone more than one flood had reached over 4 ft. Observations at Evesham, sixteen miles lower down the river, gave nearly the same results, the slight difference probably being due to the tributaries which the Avon received between the two towns.

The enormous amount of damage and loss caused by these floods, suggested forcibly the question, "Can future floods be abated," either by embanking, constructing storage reservoirs, or lowering the water level? There was a prevailing popular demand that the flood waters of the upper Thames should be stored, but probably those who urged this did not realise the enormous amount of water to be dealt with. The reservoir storage adequate to prevent floods on this river would have to be at least 160,000,000,000 gallons, and owing to the Thames valley being singularly destitute of good natural sites for reservoirs, their construction of adequate capacity would cost at least 15,000,000*l.* sterling; this probably was a sufficient reply to the suggestion of storage, regarded solely as a remedial measure against floods.

Considering that the health of the nation depended on the purity of its water supply, and considering the multitude of uses of water for manufacturing purposes, and the great pecuniary loss resulting from floods, it seemed remarkable that there was in England no central body charged with the supervision and control of so important a matter. It was believed that had a central department existed to receive information of the depth of the rainfalls, and with power to telegraph the information to local officers, having the sluices, &c., under their absolute control, much of the recent damage might have been averted.

## THE PEABODY FUND.

THE trustees of the Peabody Donation Fund have issued a report of their proceedings for the year ending December 31, 1875. The financial accounts show that the net income of the year 1875 was 18,425*l.* 18*s.* 9*d.*; which sum, added to the amount of the fund given in the last report (593,627*l.* 17*s.* 7*d.*) makes the total, on the 31st of December last, 612,053*l.* 16*s.* 4*d.* During the year the trustees have laid out, in the purchase of land and the erection of buildings, 69,092*l.* 5*s.* 3*d.*; and the sum in their hands at the end of the year available for future operations was 162,676*l.* 11*s.* 6*d.* In April last the new buildings in Duke-street, Stamford-street, were opened, and in July those in Bermondsey, giving accommodation to 424 families. The twelve new blocks of buildings in Southwark-street, for 264 families, are now finished and being occupied. These buildings being in such close proximity to the business parts of the City are most eagerly sought after, upwards of 1,000 applications having being made for 264 sets of rooms. Twelve blocks of building of 200 tenements, near the Grosvenor-road, Pimlico, are rapidly approaching completion, and will be opened during the summer. When these are occupied, the trustees will have provided dwellings for 1,846 families. The freehold of about an acre and a quarter of land in Little Coram-street has lately been purchased; but as the leases on this property have several years to run, this site may not be available for building purposes for some time to come. The average weekly earnings of the head of each family in residence at the close of the year was 1*l.* 3*s.* 10*s.* The average rent of each tenement was 4*s.* 0½*d.* per week, and of each room 1*s.* 11*d.* The tenants have the use of sculleries, laundries, and bath-rooms free of charge. The net income derived from the buildings occupied was a trifle over 3 per cent. per annum on the actual cost of land and buildings. Notwithstanding an epidemic at the Chelsea buildings, which caused a large number of deaths among the children, the death-rate for the year in the whole of the buildings taken together was 20·8 per 1,000.

## THE METROPOLITAN WATER SUPPLY.

AT the last week's meeting of the Metropolitan Board of Works, the Parliamentary Committee submitted a report to the effect that having considered a reference made to them by the Board on the subject of the water-supply of the metropolis, they were of opinion that the most effective mode of dealing with the question would be to obtain power to carry out the recommendation of the Royal Commission of 1869, that the water-supply should be in the hands of the responsible public authorities. Mr. Roche, in moving the adoption of the report, said that the question was a large and important one, and they had almost practically decided it when they settled that they could not carry out a system of hydrants while the supply remained in the hands of private companies. The whole matter had been under the consideration of a sub-committee of the Corporation and a sub-committee of the Board of Works. These committees had been attended by Mr. Goldney and Lord Camperdown, and they had come to the unanimous conclusion that they could not do better than recommend the Board to adopt the report of the Royal Commission of 1869.

After a long discussion the report was adopted, with three dissentients.

## LIGHT AND COLOUR.

SIR,—In my last I demurred to the assertion, in the preface of Mr. Cave Thomas's book, "Our physicists are just beginning to perceive" that under either hypothesis light can exist apart from the sentient being, only "as a mechanical impulse or as a vibration." Had this been said of our artists, it might have been more just. Mr. Cave Thomas himself is the first artist (so far as I know) who has clearly seen and publicly insisted upon this first principle in the science of colour; but no adept in natural philosophy can fail to distinguish between the physical agent and the sensations which it excites. They know perfectly well that the word "colour," applied to an object, merely expresses the disposition of its molecules to send somehow to the eye those kinds of light which excite the corresponding sensation. Such would be astonished to find that an artist who has thought so much on the subject should suppose there was any novelty in this part of his conclusions, except to his brother artists. But the merit due to our author is rather that which belongs to one who has struggled by his own researches to arrive at truth, than that which belongs to one who first patiently ascertains what truths have already been attained to, and then endeavours, by his own researches, to extend the bounds of knowledge. To find physicists who knew no better than to account colour in itself as a quality of the object, we should have to go back to the ages when men drew their philosophy from the conceptions of the ancient Greeks, who thought that bodies sent forth to the eye emanations from their surfaces, and that the office of light was to make the medium transparent to such emanations. In some such way as this, perhaps, Mr. Colling conceives that we become conscious of the redness of his broken brick.

I have often wondered why it is that artists in general and teachers of art do still so often contend, and so uselessly, for the notion that colour is something residing in the object. Is it that they are so enamoured of the means by which they produce their magical effects on the canvas as to attribute all to their pigments and nothing at all to the mysterious invisible agency which makes the very pigments visible, and distinguishes one from another to our sense? Is it because our Department of Science and Art still suffer to be taught in their schools the conventional system of Field, who knew no difference between pigments and colours, and founded his system upon the mixture of pigments, and, mistaking subtraction for addition, measured the intensity of his colours by the thicknesses of the coloured infusions which he used to produce them? But no rational account can be given why notions so utterly unfounded should still be maintained, and still be taught by the very class which would derive the greatest benefit from their rejection. Some ask, Why not let these notions still be taught? Does it make any difference whether artists think that they mix their colours when they mix their pigments, or not? and whether they understand the true relations of colours to each other or not? I answer: It makes the difference between an educated, intelligent, well-directed skill, and a so far empirical, and sometimes misdirected skill. Great would be the difference were nothing taught; but much greater the difference where a false theory is taught, and false rules of harmony, as the consequence of it. If what is taught is misleading, it is of course directly mischievous; if only useless, it is vexatious and discouraging, and so still mischievous. The simple truth of nature alone can be useful in this, as in every other department of science; improving the taste of the student, opening his intelligence, directing his hand, supplying what might else be wanting in his productions, and every way adding to the value of his work.

In his Introduction, Mr. Cave Thomas again asserts that any reference to colours as sensations is "a very recent innovation," and adds,—"Till lately, the theory of light was exclusively treated as a mechanical question, and quite independently of any considerations touching the sentient being. That Newton had glanced at the subject from a physiological point of view, and in reference to sensation, is probable. . . . but whatever the ideas of the master may have been with reference to the physiological aspects of his hypothesis, they were either undivulged, or were passed unnoticed by succeeding writers upon the subject." Newton's definition, given in my last letter, shows what a mistake this is, so far as Newton is concerned; and it would be easy to show from the lectures of Dr. Thomas Young, and other writers, that it is equally wrong with respect to his followers. I will give one more quotation from Newton's "Optics," to show that he not only ascribed the colour sensations to the action of the different rays of light on the optic nerves, but suggested the mode in which the nerves are probably acted on, to produce the different sensations.

"Query 12.—Do not the several sorts of rays make vibrations of several bignesses, which according to their bignesses excite sensations of several colours, much after the manner that the vibrations of the air, according to their several bignesses, excite sensations of several sounds? And particularly, do not the most refrangible rays excite the shortest vibrations for making a sensation of deep violet, the least refrangible the largest for making a sensation of deep red; and the several intermediate sorts of rays vibrations of several intermediate bignesses to make sensations of the several intermediate colours?" To which quotation, did space permit, I might add others, suggesting that the harmony and discord of colours may arise from the proportions of these vibrations; and giving a reason for thinking that the cause is of this nature on account of the "lastingness" of the sensations excited by light, and the ease with which the like sensations are produced by pressure or impact on the eye. He even goes so far as to conjecture the existence of an ethereal all-pervading medium, through which such vibrations are propagated, and to calculate that they must be above 700,000 times quicker than the vibrations of the air which produce the sensation of sound in the ear. It is much to be regretted that Mr. Cave Thomas did not attach more importance to the study of what Newton and others have recorded, before attempting a revised theory: it could not have failed to modify considerably the opinions he has expressed.

A short notice of one point more in the Introduction must conclude this letter. In page 3 Mr. Cave Thomas quotes a sentence from the late Sir J. Herschel's "Outlines of Natural Philosophy," to the effect that the undulatory theory has not been so successful as the corpuscular theory in accounting for "the production of colours by refraction of light by a prism." The treatise referred to was written, I believe, more than forty years ago, when Herschel was not fully satisfied of the truth of the undulatory theory. In a letter which he addressed to me, May 27, 1869, he refers to his more recent writings on the subject, in which no such hesitation will be found; and as in the same letter he also touches upon the subjects of this communication in other respects, I hope I shall not be thought wrong in giving the following extract from it:—

"I have to thank you for your lecture to the Royal Institute of British Architects on the Science of Colour. . . . The principles you advocate, and which, no doubt, are the true and fundamental ones of the subject, are precisely those which I have taken great pains to make current among the artistic and non-scientific part of the public, from time to time, in various publications, and more especially in a work which I must presume you have not seen, or I think you would hardly have omitted some mention of it I mean my 'Familiar Lectures on Scientific Subjects' (Strahan, London, 1866), where, in pages 257, 258, 261–265, you will find those principles clearly laid down, and their application to pictorial art pointedly insisted on. I regret to perceive, however, from the remarks made on your lecture in the discussion which ensued, by one and all the interlocutors (yourself excepted)—remarks displaying what I should call crass ignorance of the whole subject of light and colours,—how very little progress has yet been made in clearing from the artistic mind those *idola*, which, from a jargon, have fixed themselves into a doctrine, and which I highly applaud your standing forward thus prominently to dispel. The substitution of green for yellow as one of the primary colours is due to Dr. Young; but neither Wollaston nor Young ever, I believe, tried to compound yellow by mixing prismatic red and green. The experiments of Helmholtz, Maxwell, and myself have, I presume, definitely settled that point."

The last two sentences of this extract bear upon a question which I hope to discuss in my next letter. Mr. Cave Thomas asserts that all colours are equally simple: I shall endeavour to state again, and, if I can, more clearly than before, the reasons for believing that there are three simple elementary or primary colours.

W. BENSON.

P.S.—Since writing the above I have seen the letters of Mr. Cave Thomas and Mr. Colling in your number for 4th March. From the latter I hope there is not so much difference between us as seemed to be, and that Mr. Colling does not mean to deny that we become conscious of colours by means of different kinds of light, any more than I mean to deny a certain quality inherent in each object which is the cause of its colour: namely, that which makes it reflect or otherwise send to the eye those kinds of light which produce the sensation of its colour. But why does he not admit that the blue-producing rays, and the yellow-producing rays, and all, equally come from the sun, and are included in ordinary daylight? Why not agree with the whole established theory of light and colour? My next letter I hope to commence with a few remarks on Mr. Cave Thomas's letter.

## THE SYSTEMATIC MEASUREMENT OF THE HUMAN FIGURE.

SIR,—Can Mr. Bonomi give us any information how the Grecian canon of proportion, handed down to us by Vitruvius, was obtained? Does Vitruvius give the method by which it was established, or any hint by which we may arrive at the method? If not, we must accept this canon with caution as an assumption not yet proven. It is quite probable that the Greeks did set about their art in a common-sense, practical, and scientific way,—that they did not adopt certain proportions in sculpture and architecture without having sufficient reason for so doing. Still, I say, as a common-sense and practical people, we cannot accept the results handed down to us without being in possession of the data on which the Grecian canons were established,—without having, ourselves, sufficient reason for adopting them. The fatal mistake of the authors of modern works on proportion is that they think it sufficient to quote Greek example. This, however, is not enough for the scientific thinker, who requires to know the why and wherefore certain measures were adopted. The fact is, the science of proportion requires to be worked out *de novo*: this is being done, is done, but till the entire work is fully before the world we must still lend our aid.

Perhaps some of your readers will be surprised when I state that the War Office could render the arts most signal service in the matter of determining the English canon of proportion of the human figure. The height of every man in the army is, I believe, registered. We could, therefore, not only get at the standard of height in the aggregate, but at the typal stature of each regiment. Possibly the authorities may have other measurements recorded which would also furnish data. If not, with a very little additional trouble, they might have, and even obtain for us, all that we require. This example would possibly have the effect of moving other nations to do the same work, and then in a very short time we should have more extensive data than ever the Greeks had. We should be able to establish our own canons of proportion, and to test those of the Greeks.

In such a work the instrument designed by Mr. Bonomi might be of great service, and I should be well pleased if he were to be entrusted with this interesting survey and mapping out of the human frame. But if he should consider it a too formidable undertaking it would be one well worthy of the British Association if this had in view, as it ought, the advancement of art as well as of science. METER.

## SILICATE PAINT.

SIR,—I have noticed an article in your number of February 5th, 1876, under the heading, "Lead Colic in Devonport Dockyard." It strikes me that the workmen in Devonport Dockyard, who, as the article says, are exposed to great danger from the cloud of dust produced by hammering off the ships the old lead paint, might be spared the great risk, as also might the painters. I do not know whether the authorities of that dockyard are aware of the existence of the silicate paint which is being manufactured in Liverpool. This paint is altogether free from lead or any other poison, and is superior to white-lead in many ways. First of all, it is quite harmless to the health of the painter; next, it always retains its opacity, which white-lead does not; it never tarnishes, and it will not change tint even in water-closets, or near drains, or in foul air. I have seen objects painted with the silicate paints which were submitted to all kinds of experiments to test the merits of the pigment, and I was surprised at its valuable properties. It certainly deserves the attention of every one in the trade. ALFRED LUTSCHAUNIG.

*Liverpool Assay Office.*

## CEMENTS.

SIR,—Portland cement is the most useful article ever introduced for plastering and brick-work, both for external and internal work, but I am sorry to say there is a great difference in some of the Portland cements. In many instances it has been abandoned for plastering purposes on account of failure, but as I travel about the metropolis and look at the various buildings done with the original material, as a practical man I cannot detect any failure, or see where the action of the weather has disarranged the work to any extent; but whether it is on account of competition in the manufacture, or the great demand for the material, a great deal of the Portland cement of the present day is different from what it was originally. Other cements used for internal purposes, such as Keene's, Parian, and Martin's, are all very valuable materials if not abused by mixing other materials with them, thus destroying their properties, and making them less hard than the ordinary plastering. In some cases, where the work is supposed to be done with one or the other of the above-named materials, scarcely anything has been used in the works but coloured water or putty and plaster.

A PRACTICAL PLASTERER.

## "STEEPLE JACK."

SIR,—I do not know whether the following suggestion is new or not:—To get a rope over the top of a high chimney, fire a rocket, with cord attached, up the inside of the chimney. The head of the rocket may require a wire guard to prevent it catching against the sides.

W. H. M.

## SOME NEW BANK PREMISES.

*Dundee.*—The new Clydesdale Bank buildings, Dundee, are being rapidly proceeded with. The site is triangular, with the corners rounded off. The building takes the same form, and is surrounded by streets on every side, from 50 ft. to 60 ft. wide. The bank building and its accessories may be said to have three sides, two stories and a basement. That to the High-street is 36 ft. 6 in., and to the Seagate 74 ft., and to the Murraygate 68 ft., receding from the High-street 63 ft. The remaining portion of the building is a parallelogram, with the ends slightly rounded, and facing Commercial-street, with a frontage of 89 ft., in which will be shops on the ground-floor and offices above. The style is Italian, of a bold and massive character. The architect is Mr. William Spence, of Glasgow, and the contractors for the various works are:—Messrs. Mann & Myles, masons, Dundee; Messrs. D. Kidd & Son, joiners, Dundee; Mr. D. Brown, plumber, Dundee; Messrs. Alison, Brothers, ironfounders, Glasgow; and Messrs. Stewart & Murray, glaziers, Dundee. Mr. John Proudfoot, Glasgow, is the inspector of works.

*Elgin.*—The directors of the City of Glasgow Bank have just determined upon some extensive alterations and additions to their banking premises at Elgin, a building recently purchased, but which is just a century old. The successful contractors are:—Messrs. Alexander Allan, mason; James Macbeth, carpenter; John Gordon, plumber; M'Ivor & Younrie, plasterers; and John Kintrea, painter. The alterations will consist chiefly of the conversion of the present three stories into two, and the enlargement of the office, shop, and other internal accommodation. The front of the entire structure is to be refaced with Greenbrae and Clashach freestone, from the quarries near Hopeman; and the architect—Mr. A. M. Mackenzie—has endeavoured to preserve in its entirety the style, which is Queen Anne or Georgian.

*Norwich.*—Messrs. Lacon & Co.'s new branch bank, situated on the Gentlemen's Walk, which will shortly be opened for business, is an imposing building in the Italian style. It has been built by Mr. Downing, of Norwich, from the designs of Mr. W. O. Chambers, architect, of Lowestoft. The stonework was entrusted to Mr. Rust, and the decorative carving, of which the façade presents some elaborate specimens, was executed by Mr. Barrett.

*Stockton.*—The premises for the Stockton Branch of the National Provincial Bank of England have so far approached completion as to have been opened for business. The total cost will be about 20,000*l*. The structure, which has been two years in progress, is situated in a commanding position in the centre of High-street, having a front of Barnard Castle stone. Mr. Marshall, of Darlington, is contractor for the building; Messrs. Punch Brothers, of Middlesbrough, for the office fittings; Mr. Myes, of Redcar, for plastering; Messrs. Hind & Son, of Stockton, for gas fittings and plumbers' work; Messrs. Gargate & Son, Darlington, joiners; Mr. Dryden, of Darlington, for the painting; and Mr. C. Young, of Stockton, for mantel-pieces, &c.

## ST. WERBURGH'S TOWER, BRISTOL.

THE Vandalistic mania for church destruction seems to have travelled from London to Bristol. St. Antholin's and other churches in London have been and are to be sacrificed at the behest of the Ecclesiastical Commissioners,—whether in pursuance of statutory powers or not it is comparatively useless to inquire after the mischief has been done. Street improvements are the pretext at Bristol. It appears that a Bill is now before Parliament for the purpose of pulling down St. Werburgh's Church, and, with the funds realised by the sale of the churchyard, to build another church in one of the outskirts of the city; but we are glad to see that an influential meeting was held on the 3rd inst., under the presidency of the Mayor, to endeavour to take steps to secure the retention of the tower. The following resolution was unanimously adopted:—

"That, considering the picturesque beauty of the tower of St. Werburgh's Church, which forms so striking an ornament to our ancient city of Bristol; considering the historical associations, dating from the fourteenth century; and considering, moreover, that the proposed widening of the adjacent streets need not be interfered with by the retention of the tower in question, this meeting strongly urges the retention of the tower and the construction of a footway through it, and respectfully solicits the Bristol Town Council to take such steps as may be necessary to this object."

As at St. Antholin's, London, it seems to be a foregone conclusion that the church must go, but it is earnestly to be hoped that the efforts to preserve the Bristol tower will be more successful than the exertions made to preserve Wren's tower at St. Antholin's.

## HOW DRAIN-PIPES ARE LAID AT BILSTON (AND ELSEWHERE).

AT a recent meeting of the Bilston Township Commissioners, Mr. Rogers, chairman of the Streets and Sewers Committee, stated that a few weeks ago, Mr. Morell, the agent of certain property in the neighbourhood of Salop-street, called his special attention to some sewerage work which was being executed by the Board's contractor for private drainage works (Mr. Roper). On going there he saw a large number of pipes, and he was much surprised to see what he considered imperfections in them, both as regarded the quality of the material of which the pipes were made and the manner in which they were being laid. He afterwards instructed the clerk to write to Mr. Roper, the contractor, asking him to postpone further operations. The Streets Committee subsequently met, and at his (Mr. Rogers's) request a sub-committee was appointed to investigate the works that had been carried out by the contractor. This had accordingly been done, and they had drawn up the following report:—

"Your sub-committee appointed by your Streets Committee, and also instructed by your Board, have proceeded with their investigations into the sewering on private property, and constructed by your Board's contractor, with results as follows:—

Your sub-committee have investigated cases in which the earth was thrown out and the pipes bared, and in some instances taken out. In the first case, they found, in a total of nineteen pipes, ten had broken sockets; in five other cases they found 4-in. pipes were used and 6-in. charged. In all cases, with one exception, where junctions should have been used, none were put, the end of one pipe being placed against another, which was broken to receive it. No clay was used to joint the pipes, as required in the specifications, and in the only case where we levelled we found the fall 3 in. in 34 ft., equal to 1 ft. in 136 ft., instead of 1 in. in 20 in., as required by the specification. The drain traps were inefficient. One was broken, and in some cases the yards were badly laid or relaid. In all the cases we investigated we found materials of a very inferior character, and the work executed in a most wretched and unsatisfactory manner, and almost useless for its purpose. In three other cases your committee intended investigating we found your contractor had preceded us, and taken out and relaid the sewering. The above cases are so serious that your sub-committee cannot arrive at any satisfactory decision, but leave it in the hands of your Board."

Mr. Rogers moved the adoption of the report, and advocated the taking of legal proceedings against the contractor.

Mr. Jeavons asserted that the information contained in the report was no news to the Board. Last summer some private drainage work was done so badly that the pipes had to be relaid. He complained to the Board, but was only snubbed for his pains.

Mr. Taylor, the surveyor to the Board, said it had always been his rule to allow the contractor to put a 4-in. in place of a 6-in. in connexion with gullies, as the smaller pipe made the better joint, but he had never had the least suspicion that the contractor had been using 4-in. pipes generally, and with an exceptional number of broken sockets. He had never certified that the contractor's work had been properly done until he had interviewed the contractor three times,—when he told him what work was to be done, when he saw the work being done, and when he measured the work after it had been completed.

The Chairman admitted that the Board had known what was going on, but had deferred taking action until the matter could be put before the public.

The motion was adopted, and the committee was directed to inquire into the conduct of the surveyor in the matter, and to take advice as to legal proceedings against the contractor.

## DAMAGE OF BUILDING GOODS BY RAILWAY COMPANY.

CARD *v.* LONDON, BRIGHTON, AND SOUTH COAST RAILWAY COMPANY.

IN this case, heard in the Lewes County Court on the 22nd ult., Messrs. Card & Sons, builders, of Lewes, sued the London, Brighton, and South Coast Railway Company for 1*l*. 16*s*. 4*d*., value of goods damaged by negligence. The plaintiffs' case was that their agents put on the rail at Battersea some 140 drain-pipes for delivery to Mr. Henry Constable, of Barcombe. On arrival at the latter station twenty-seven were found to be broken, and the present action was to recover from the company the value of the broken pipes. It appeared that the goods were packed by the plaintiffs' agents, and a note was signed declaring the pipes to be forwarded at owner's risk; but the judge held that as this note was signed after the packing of the pipes in the wagon, and as by it the company declared to have received the goods in good condition, they were liable for the damage done, unless it could be shown that the breakage had resulted from a collision or circumstances of pure accident. For the defence it was contended that the state of the goods on arrival at Barcombe showed that they were improperly packed; but the judge, holding that this was not sufficient, gave a verdict for the plaintiffs for the amount claimed.

**Society of Lady Artists.**—The Exhibition for 1876 will be held in the Gallery, 48, Great Marlborough-street, and will be opened to the public on the 13th inst.

"TOBIN'S VENTILATORS."

SIR,—I have read with much astonishment a statement to the effect that the School Board for London have paid Mr. Tobin a sum of money for permitting them to make use of the system of air-inlets which now bears his name.

I should like to add my testimony to that which I have little doubt your announcement will draw forth from other quarters, of the completeness with which this so-called invention had been anticipated. In 1862 I employed these inlets in St. Paul's Schools, Allen-street, Clerkenwell, of which building I was architect, on the recommendation of Mr. Richard Moreland, the well-known engineer, who had himself known them to be successfully in use in previous instances. This carries the matter back thirteen years. I have no doubt it might be carried back still further. T. ROGER SMITH.

## Miscellanea.

**Masons' Wages at Newcastle-upon-Tyne.** A meeting of stonemasons was held on the 3rd inst., at Newcastle, for the purpose of considering the wages question, and deciding what course should be pursued in the future in view of the compromise offered by the masters. Six months ago notice, was given by the working masons to their masters of their intention to apply for an increase of wages on the 1st inst. A meeting took place between masters and men, when both sides of the case were stated. The men held that their standard wages,—34s. a week,—was much too little remuneration for their labour, and demanded an augmentation to the extent of 4s. per week. The employers, on the other hand, maintained that the advance sought was more than they ought to be called upon to concede; but they offered to compromise the matter by giving them 2s. a week extra. The meeting of the men on the 3rd inst. was convened for the purpose of submitting this proposition to the general body of the workmen and ascertaining their views on the matter. The meeting was throughout in favour of adhering to their original demand, and resolutions were passed rejecting the offer of their employers, and asserting the expediency of standing out for the entire advance demanded. The question of arbitration was mooted, but the feeling of the meeting was decidedly against submitting to that mode of settlement.

**The Strike of Sheffield Plumbers.**—On the 29th ult., the six months' notice given by the operative plumbers of Sheffield to their masters, for a reduction of hours and an advance of wages, expired, and as no settlement had been arrived at, the men were paid off at their own request. The plumbers have hitherto been working on the "datal" system, by which they made fifty-five and a half hours per week, and received 5s. 8d. per day for five days, and 3s. 8d. on the Saturday, or 32s. per week. The notice which they sent to the employers was to the effect that their wages should be increased to 34s. per week, and that the working-hours should be reduced to forty-nine and a half, as in the other branches of the building trade. This having been the standard of the latter for about three years, the masters agreed to put the plumbers on an equal footing, but instead of paying them by the day, to give them 8d. per hour. The men accepted the proposed hour-system, but asked for 8½d. per hour. On the 29th ult. the employers met at the Three Tuns Inn, and passed a resolution agreeing to refer the matter to arbitration of disinterested parties, chosen by both sides; and to pay the difference from the present date should the decision go against them, on the understanding that the men in the meantime should resume work. This resolution was communicated to the workmen's committee, but they sent a reply stating that they would abide by their former resolution.

**Sewage Utilisation at Liverpool.**—The report of the directors of the Liverpool Sewage Utilisation Company, which has just been issued, shows that the affairs of the company are not in a very flourishing condition. The directors have had to advance or guarantee about 1,900*l.*, and though they consider it is only a question of time for the demands of the sewage to become larger, they think some fresh arrangements ought to be made for the future. It is proposed, therefore, to enter into certain arrangements as to leasing, or failing these, to wind up the company altogether.

**United States Pottery.**—A recent number of the *Crockery and Glass Journal*, published in New York, contains an account of the second annual convention of the United States Potters' Association, held at Pittsburgh a few weeks ago. The first "regular toast" was "The Ceramic Art," proposed by the president and responded to by the Hon. J. H. Brewer, of Trenton. In the course of his speech, Mr. Brewer said thirty years ago there was no successfully-worked pottery in the United States, while now no less than forty-three firms were busily engaged in producing ware, from the cheapest to the best quality. He gave the following statistics relative to the United States Potters' Association:—Number of kilns of the association, 136; value of goods sold in 1875, $2,993,000; increased value sold in 1875 over 1874, $200,000; capital invested, $4,089,000; yearly wages, $1,110,000; horse-power, 1,000; capacity worked full, $4,895,000; coal used, 50,000 tons; clay used, 20,000 tons; flint and spar used, 15,000 tons; white lead used, 300 tons; imported goods sold in 1873, 80,000 packages; in 1874, 66,000; in 1875, 61,000; showing a steady decrease in importations amounting to $1,500,000 in ten years, which the United States had gained.

**Ely Chapel, Holborn.**—We mentioned some time ago that the ancient chapel belonging to the palace of the Bishops of Ely in Holborn was sold at the Auction Mart, and that it was purchased by one of the religious orders of the Roman Catholic Church. The chapel was at that time under a lease to the Welsh Protestant Episcopalians, who have continued to use it for their services for about thirty years. Their lease expires at Lady-day, but we understand that possession will to-day be handed over to the Fathers of the Institute of Charity, founded by the Abbate Rosmini. The pews and galleries will be cleared away, the walls relieved of their coats of plaster, and the inner ceiling, also of plaster, removed, so as to display the oak timbers of the roof. The crypt, when emptied of the rubble and rubbish with which it is now blocked up, will form a spacious apartment, partly lighted by side windows, and will be used as a place for the meetings of religious confraternities, temperance associations, &c., and possibly also for purposes of instruction and lectures. Messrs. Young & Whelan are the architects.

**The New Street from Charing-cross to the Embankment.**—At last week's meeting of the Board of Works, Mr. Richardson brought up a report from the works committee, recommending that the new line of roadway from Charing-cross to the Victoria Embankment be named Northumberland-avenue. He said the committee had carefully considered the question of the name to be applied to this thoroughfare, and the majority appeared to be of opinion that the old name of Northumberland should be retained. A short and lively discussion ensued, in which it was stated that there were three streets in the metropolis named Northumberland,—one in the Strand, one in Poplar, and the other in Marylebone. The word "avenue" was objected to on the ground that it was an American term, and that there was no wish to Americanise the streets of London. The report of the committee was adopted, and the new street, which will be opened on the 11th inst., will thus be called "Northumberland-avenue." We cannot say we like it much; however, "it will serve."

**The Proposed Aquarium and Winter Garden for Ramsgate.**—The plans sent in in competition for the new Winter Gardens, Skating-rink, Aquarium, and Assembly-rooms at Ramsgate, are now on exhibition at the Custom-house. The design of Messrs. Pennington & Bridgen shows a Palace of Varieties, intended to be comprised in an area of 320 ft. by 85 ft. The style of architecture is Italian, and the centre of the building, which will be devoted to a floral hall, will contain foliage plants and choice exotics, rock-work, and fountain, and will be flanked with four campanile towers, and domed, whilst the east wing will be occupied by a spacious assembly-room, available for all description of entertainments, and on the basement will be a fresh water and marine aquarium, where the salt-water tanks, being almost on the same level as the sea, will be supplied with water without the aid of costly pumping machinery. The skating-rink, which will be in the east wing, will be decorated with shrubs and rocks in the centre.

**New Groynes at Brighton.**—At a meeting of the Brighton Town Council, on the 1st inst., the Works Committee brought up a special report upon the subject of repairing the existing groynes and constructing new ones, in accordance with suggestions of the surveyor (Mr. P. C. Lockwood). It was proposed to heighten the wooden groyne opposite the Old Steine, and extend it 160 ft. from the tower-like erection forming the termination of the storm-water overflow; such extension to be formed of concrete blocks 9 ft. in width at the top. This, it was calculated, would carry the fall of the beach 130 ft. further southward on the west side, and fill in the bay as far as the concrete groyne opposite East-street, rendering no other defensive structure necessary between those two points. The surveyor also proposed to repair the Black Rock groyne, a portion of which had been washed away. He was also preparing plans for a concrete groyne opposite Paston-place. The committee resolved that the works recommended by the surveyor be done, at an estimated cost of 3,000*l.* for the groyne opposite the Old Steine, and 800*l.* for the repairs to the Black Rock groyne. The report was adopted.

**Contracts for Paving Materials, &c., at Newington.**—At the meeting of the Newington Vestry, on the 1st inst., the following tenders were accepted, viz.,—Messrs. Stiff & Son, drain-pipes; Messrs. Jukes, Coulson, Stoke, & Company, ironwork; Mrs. E. Beevers, for the supply and execution of paving works, at the following prices:—2½-in. York paving, 9d. per foot; Rockhill, 9½d. per foot (laid); Aberdeen granite kerb, 12 in. by 6 in. (laid), 1s. 7½d. per foot; Guernsey granite kerb (laid), 1s. 7½d. per foot; 2½-in. Yorkshire paving, 2*l.* 19s. per 100 feet; ditto, 2½-in., squared, 3*l.* 4s. per 100 feet; Mr. G. Roots, broken flints, 3s. 10½d. per cubic yard; Mr. John Chamberlain, brooms, &c.

**Parochial Contracts at Chelsea.**—At the meeting of the Chelsea Vestry on the 29th ult., Mr. Lahee, the clerk, read a tender from Mr. Charles Wright for horse-hire, which was:—For man and horse for working Bayley's vans, 15s. per day, and for ordinary carts, 12s.; for carting granite, &c., 12s. per day; for horse, driver, and one-horse cart for general use, 12s. per day; for horse, cart, and man, and a man for slopping, 15s.; for dusting, 15s.; for horse for sweeping machine, 12s. 6d. per day; for a single chaise-horse, and driver, 10s. 6d. per day. Mr. Wynn, contractor for the first item, 12s. per day; th, next, 10s. 6d.; the third, 1s. 10d. (per load, noe per day), the two next 10s. 6d., the next, 15s.t and the last, 10s. The tender of Mr. Wynn was, accepted.

**China Clay in the Helston District.**—It is stated that there is a prospect of the china-clay deposits of the Helston district being worked on a rather considerable scale. So far, although the clay has been found to be of good quality, operations have been carried on in so contracted a way as to place this business at an unmerited disadvantage when compared with the immense establishments of the St. Stephen's district. This, however, it is hoped, will speedily be remedied, and it is believed that the Tregoning Hill district will rival in quantity and quality the most favoured localities that are now the scene of china clay and stone production, and introduce a fresh element of prosperity to the town of Helston.

**Oxford Architectural and Historical Society.**—The first walk of this Society for the present term took place on Saturday, the 19th ult., when a numerous party assembled in the Hall of Oriel College, where Mr. Butler gave an interesting historical sketch of the origin and early history of the college, and the party then proceeded to visit the chapel, library, and other buildings. At the conclusion, a hearty vote of thanks was accorded to Mr. Butler. It had been intended to pay a visit to St. Mary's Hall the same afternoon, but time would not permit of this. A meeting of the Society was held on the 22nd ult., in the Taylor Building, when a paper was read by Mr. A. J. Evans, B.A., Brasenose College, on "Some Roman and other Antiquities in Ancient Illyricum."

**Mr. Ruskin** was, on the 26th ult., re-elected to the Slade Professorship of Fine Art at Oxford, an office which he has already held for two terms of three years. During Mr. Ruskin's tenure of office, he has given 5,000*l.* for the purpose of a drawing-school, and a collection of pictures valued at a similar sum. He also provides 150*l.* per annum for the payment of a teacher of drawing.

**Hastings Baths and Aquarium.**—At a special meeting of the shareholders of this company, on Monday, the directors reported that the tender for the completion of the whole work was in excess of 33,000*l.*, and which sum is beyond the capital powers of the company. The directors recommended the abandonment of the aquarium part of the scheme, which would cost 5,000*l.*, for the present; and (owing to a difficulty in arranging with the contractor) that they should be sanctioned in carrying out the work for the baths themselves. The architects concurred in the recommendation. It was unanimously agreed to confirm the proposals of the directors.

**Gift to Birmingham.**—The late Mr. William Dudley, an old Birmingham resident, who died recently, has vested the sum of 100,000*l.* in trustees, to be applied for the following purposes:—First, to assist young tradesmen of good character in Birmingham who are commencing business, by lending them moderate sums of money at a low rate of interest; secondly, to make annual grants or benefactions towards the maintenance and support of aged tradesmen within the limits of the borough; thirdly, any surplus income arising from the trusts to be divided among the medical charities of the town.

**The Heating Apparatus at the Yarmouth Workhouse.**—A new heating apparatus has just been erected in Yarmouth Workhouse by Messrs. Warner & Sons, Ipswich, the architects being Mr. Whitmore and Mr. J. T. Bottle. The apparatus itself is to some extent similar to one erected in the Ipswich Asylum. Three boilers in the washhouse and those throughout the house formerly heated by fires, are heated by steam. In the washhouse of the women's sick-ward the agency of steam is also employed with two boilers. In the cooking department all is done by steam.

**The Institution of Civil Engineers.**—The attention and consideration shown by the members of this body to foreign professional brethren, when visiting our public works and engineering establishments, has been recently recognised by the King of Portugal, who has conferred on the secretary of the Society, Mr. James Forrest, the insignia of a Commander of his Military Order of Jesus. On a former occasion the Emperor of Brazil appointed Mr. Forrest a Knight of his Imperial Order of the Rose.

**Art in Japan.**—The Japanese Government have applied to the Italian Government for three professors to fill three chairs of architectural drawing, ornamentation, and sculptural painting in the Academy of Fine Arts recently founded. 20,000 francs a year, besides lodging and the expenses of their journey, will be given to each.

**Architects' Benevolent Society.**—The annual meeting of this Society was held at Conduit-street, on Wednesday evening, Mr. Horace Jones in the chair. Our report is crowded out this week, but will appear in our next number.

**London Hospital.**—According to the daily papers, her Majesty the Queen, on Tuesday last, opened a new wing here, which has been built mainly at the cost of the Grocers' Company. The managers of the hospital apparently thought it best not to invite criticism.

**Reimes Cathedral.**—On the report of M. Viollet-le-Duc considerable works of restoration are to be done here. The Government has made a grant equal to about 80,000*l.* for the purpose. Parts of the cathedral are described as being in a very threatening condition.

**The Boucicault Memorial.**—At a meeting of the Huntingdon Town Council recently the mayor stated that Mr. Boucicault had expressed a desire to place a fountain on the Market-hill, and restore the Grammar School building inside and out.

**Siberian Ivory.**—A letter from Yakoutsk states that at the last fair in that town a larger quantity of mammoth ivory was disposed of than has ever before been known. Several of the tusks were of great size, one pair weighing 60 lb.

**Slaughter-houses.**—The paper on London Slaughter-houses and Cow-sheds, read by Dr. Orme Dudfield at a meeting of the Society of Medical Officers of Health, together with a report of the discussion which followed, has been printed in a separate form.

**The Wolverhampton Carpenters.**—The operative carpenters and joiners of Wolverhampton have sent in a request to their employers for an increase of 1d. per hour wages. The present rate is 7½d. per hour.

**Artisans' Institute.**—The hon. secretary of the Society of Dressmakers writes to say that, on the third evening of the discussion as to Piece-work, the amendment condemning piece-work was carried unanimously.

**Aquaria: Their Construction, Management, and Utility.**—A paper on this subject was read at the Society of Arts by Mr. Saville Kent, on the 1st of March. It is printed in the journal of the Society.

**Aberdare Local Board Waterworks.**—The contracts for the pipe-laying, amounting to 23,000 yards, undertaken by Messrs. Chandler & Sons, of York-street, Southwark, has been completed, and within the specified time.

## TENDERS

For new club-room at Brighton, for Mr. F. E. Clarke. Messrs. W. F. Stevens & Co., architects:—

| | | | |
|---|---|---|---|
| Colwell | £679 | 0 | 0 |
| Patching & Webber | 667 | 10 | 0 |
| Hindess (accepted) | 425 | 0 | 0 |

For draining and laying out new cemetery at Wimbledon, for the Local Board:—

| | | | |
|---|---|---|---|
| Andrews | £3,800 | 0 | 0 |
| G. Jackson | 2,523 | 0 | 0 |
| J. Jackson | 2,449 | 0 | 0 |
| Gregory | 2,161 | 0 | 0 |
| Crockett (accepted) | 2,030 | 0 | 0 |
| Bull | 1,979 | 0 | 0 |
| Taylor | 1,140 | 0 | 0 |

For school and residence, West Tilbury, for the West Tilbury School Board. Mr. Thomas Goodman, architect. Quantities supplied:—

| | | | |
|---|---|---|---|
| Roberts | £1,333 | 0 | 0 |
| Patman & Co. | 1,185 | 0 | 0 |
| Hobson | 1,133 | 0 | 0 |
| Blake | 1,056 | 0 | 0 |
| Wood | 1,046 | 0 | 0 |
| Hammond | 930 | 0 | 0 |

For the erection of villa residence at Leigh Woods, near Bristol, for Dr. Wheeler. Mr. H. Shaw, architect:—

| | | | |
|---|---|---|---|
| Eastcourt | £2,451 | 0 | 0 |
| Davey | 2,219 | 0 | 0 |
| Eastbrook & Sons | 2,192 | 0 | 0 |
| Veals | 2,120 | 0 | 0 |
| Williams | 2,060 | 0 | 0 |
| Davis & Sons | 1,950 | 0 | 0 |
| Stephens & Bastow | 1,940 | 0 | 0 |

For fire-proof floor and additional story to warehouse, Hatton-garden. Mr. J. W. Reed, architect:—

| | | | |
|---|---|---|---|
| Brown (too late) | £462 | 0 | 0 |
| Bamford | 456 | 0 | 0 |
| Smith | 452 | 0 | 0 |
| Hawkes | 425 | 0 | 0 |
| Bayes, Bros., & Allen | 415 | 0 | 0 |

For erection of detached villa residence, Edgware. Mr. J. W. Reed, architect:—

| | | | |
|---|---|---|---|
| Crabb | £2,350 | 0 | 0 |
| Hunt | 2,350 | 0 | 0 |
| Ramage | 2,315 | 0 | 0 |
| Bayes, Bros., & Allen | 2,290 | 0 | 0 |
| Hawkes | 2,220 | 0 | 0 |
| Southcott & Co. | 2,197 | 0 | 0 |
| Allen | 2,120 | 10 | 0 |
| Thomas | 2,047 | 0 | 0 |

For erection of detached villa residence (to be called "Oaklands") upon the Oakfield Estate, Crouch-end-hill, Hornsey. Mr. J. W. Reed, architect:—

| | | | |
|---|---|---|---|
| Kirk & Randall | £3,622 | 0 | 0 |
| Downs & Co. | 3,244 | 0 | 0 |
| Southcott & Co. | 3,174 | 0 | 0 |
| Crabb | 3,100 | 0 | 0 |
| Ramage | 3,072 | 0 | 0 |
| Scrivener & White | 3,065 | 0 | 0 |
| Bayes, Bros., & Allen | 3,050 | 0 | 0 |
| Hunt | 3,047 | 0 | 0 |
| Hawkes | 2,715 | 0 | 0 |

For sinking a deep well on the site of proposed School for Imbecile Children, Darenth, Kent, for the Metropolitan Asylums Board. Messrs. A. & C. Harston, architects:—

| | | | |
|---|---|---|---|
| Tilley (accepted) | £1,198 | 0 | 0 |

For building new Congregational Church and School, Guildhall-street, Canterbury. Mr. J. G. Hall, architect. Quantities not supplied:—

| | | | |
|---|---|---|---|
| Cosens | £4,470 | 0 | 0 |
| Gaskin | 4,426 | 0 | 0 |
| Wilson | 4,400 | 0 | 0 |
| Naylar (accepted) | 4,311 | 0 | 0 |

For the erection of a factory at the corner of Great Suffolk-street and John-street, Southwark, for Mr. Thos. Bear. Mr. Joseph S. Moye, architect:—

| | | | |
|---|---|---|---|
| Henderson | £2,563 | 13 | 0 |
| Manley & Rogers | 2,514 | 0 | 0 |
| Sharpington & Cole | 2,242 | 0 | 0 |
| Newman & Mann (accepted) | 2,145 | 0 | 0 |

For erection of new premises, 303, High Holborn, for Mr. Lynch. Messrs. John Giles & Gough, architects. Quantities by Mr. C. H. Goode:—

| | | | |
|---|---|---|---|
| Southcott & Co. | £2,692 | 0 | 0 |
| Grover | 2,613 | 0 | 0 |
| Hook & Oldrey | 2,520 | 0 | 0 |
| Newman & Mann | 2,510 | 0 | 0 |
| Bayes, Bros., & Allen | 2,466 | 0 | 0 |
| Nightingale | 2,453 | 0 | 0 |
| Crabb | 2,449 | 0 | 0 |
| Stephenson | 2,251 | 0 | 0 |

For the erection of a mortuary, coroner's court, &c., on the Spa-fields Burial-ground, for the Vestry of the Parish of St. James and St. John, Clerkenwell. Mr. H. Saxon Snell, architect:—

| | | | |
|---|---|---|---|
| Crockett | £2,700 | 0 | 0 |
| Wall Bros. | 2,491 | 0 | 0 |
| Stephenson | 2,452 | 0 | 0 |
| Staines & Son | 2,443 | 0 | 0 |
| Ebbage | 2,438 | 12 | 6 |
| Hunt | 2,327 | 0 | 0 |
| Patten (accepted) | 2,260 | 0 | 0 |

For a tenement block of buildings, Disney-street, Borough, for the Workmen's Dwellings Improvement Company (Limited). Mr. Frank E. Thicke, architect. Quantities supplied by Mr. C. S. Mumby:—

| | | | |
|---|---|---|---|
| Stephenson (accepted) | £10,104 | 0 | 0 |

For the erection of house and stables, Kidbrooke-grove, Blackheath, for Mr. A. Marten. Messrs. H. C. Barlow & J. C. Boys, architects. Quantities prepared by Mr. W. Matthews:—

| | | Extra for Stone Front. |
|---|---|---|
| Colls | £5,940 | £450 |
| Newman & Mann | 5,453 | 500 |
| Carter | 5,284 | 440 |
| Gorham | 5,159 | 536 |
| Bayes, Bros., & Allen | 5,148 | 350 |
| Bland | 5,105 | 560 |

## TO CORRESPONDENTS.

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We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

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